TREE

Micro and Project-based learning for Teaching ciRcular Economy and Ecological awareness in VET schools

Methodological Material

Methodological material authors

Bajorūnienė Aurima, Crippa Carlotta Maria, Feiferienė Rusnė, Kapočius Žilvinas, Molhova-Vladova Miglena, Navikienė Živilė, Rudminaitė Edita, Sapronienė Dalia, Tsokova Desislava, Valonienė Alma, Williams Relika Alliksaar, Zaborskienė Olga.

Methodological material collaborators

Drąsutė Vida

Methodological material editor

Crippa Carlotta Maria

Methodological material designer

Rudminaitė Edita

Website and social media

Website: https://treeproject.eu/
Instagram: www.instagram.com/tree_euproject/?hl=en
LinkedIn: www.linkedin.com/showcase/tree-project
Facebook: www.facebook.com/TREE.project.for.teaching.circular.economy

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TABLE OF CONTENTS

1 INTRODUCTION

CHAPTER 1

INTRODUCTION

The Methodological Material is the first result foreseen by the project "*Micro- and project-based learning programme for Teaching ciRcular Economy and Ecological awareness in VET*", from now on called "TREE project".

The TREE project is funded under the Erasmus+ programme - Cooperation partnership in vocational education and training. The general objective of the project is to increase the employability of VET[1] students in the process of change towards a more sustainable and circular economy and to make them aware of the environmental issue, by providing them with skills and knowledge related to those themes.

In particular, the project aims to: integrate the teaching of CE and sustainability into VET schools' curricula and subjects taught; create a closer link between VET institutions and businesses that adopt sustainable practices; increase the attractiveness of VET schools by increasing the employability of VET students; promote the adoption of eco-friendly practices in students' daily life; support and encourage the transition from a linear economy to a circular economy.

The present Methodological Material resulted from a joint effort of the TREE project partners, that are:

- Public institution "eMundus" (project coordinator), *Lithuania*
- Kedainiai Vocational Educational Training Centre, *Lithuania*
- S.A.F.E. projects, *the Netherlands*
- Valga County Vocational Training Centre, *Estonia*
- Zinev Art Technologies Ltd., *Bulgaria*
- Vocational School "Prof. Dr. Asen Zlatarov", *Bulgaria*

It aims at providing the reader with a comprehensive review of the Circular Economy (CE) and sustainability actions implemented both at European and at national level, of the green skills and their impact on the economy and of the Education for Sustainable Development (ESD) and its promotion.

In particular, Chapter 2 aims at defining the concept of ESD, showing how it has evolved during the years and how it can and should be promoted in VET centers.

Chapter 3 contains the main findings of the transnational research carried out by partners from February to May 2022. In particular, it aims at showing the state of art in partner countries when it comes to CE, ESD, green skills and sustainability. Moreover, it sums up the results of the field

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[1] Vocational Education and Training

research which involved VET teachers, "green" companies' members and representatives of NGOs active in the field of education and environmental protection.

Chapter 4 and 5 regards respectively the green skills and the effects of the green transition on the job market. More specifically, Chapter 4 defines what "green skills" are according to the TREE project's partners, why they are important and how they can be promoted in VET school. The chapter also contains some national and international good practices collected by the project partners. Additional good practices can be found as annexes to the Methodological Material. Chapter 5 deals with the effects of the shift toward a greener and circular economy on the job market, focusing on the following economic sectors: agrifood, wood and plastic. These sectors were selected due to their great relevance for accelerating the green transition.

Chapter 6 and 7 are related to the teaching methodologies that will be adopted within the TREE training programme, i.e. the second result of the TREE project. The project-based learning methodology and the micro-learning methodology are both described in detail and examples of their applicability are shown.

Some concluding remarks are exposed in the final chapter, together with the summary of the main information contained in the rest of the document.

The TREE Methodological Materials has a twofold importance. In fact, it is not only fundamental for the development of the next project's activities and results, but it also represents a comprehensive document per se, which can be used by VET teachers, companies, NGOs, experts in the fields but also by the general public to have a clear understanding of the ESD, the CE and the sustainability.

In fact, it takes into consideration the needs and priorities of each partner country in terms of CE and sustainability, the skills and knowledge sought by businesses, the good practices already used in teaching these topics to students, and the needs of VET schools.

The acquisition of greater knowledge on how to promote environmentally friendly actions and of higher awareness on the importance of these issues is the hoped impact of this document.

Keywords: *methodological material, TREE project, circular economy, sustainability*

2

WHAT IS EDUCATION FOR SUSTAINABLE DEVELOPMENT (ESD)

CHAPTER 2

WHAT IS EDUCATION FOR SUSTAINABLE DEVELOPMENT (ESD)

Author:
Miglena Molhova-Vladova, Zinev Art Technologies (Bulgaria)

1.   INTRODUCTION ON ESD

Education for Sustainable Development (ESD) is the response of the education system to the urgent and dramatic challenges our planet has been facing for years now. The concept of ESD is not new, since the collective activities of human beings have altered the Earth's ecosystems and the need for generations to be educated on how to live and thrive in societies in a sustainable way has   been long recognized. Currently our very survival seems in danger because of everyday changes getting more difficult to reverse. To contain climate changes, health, and economic changes before they reach catastrophic levels means addressing environmental, social, and economic issues in a holistic way.

ESD has been defined in different ways through the years. Back in the late '90s the Sustainable Development Education Panel First Annual Report (1999) defined it as follows: "*ESD is about the learning needed to maintain and improve our quality of life and the quality of life of generations to come. ESD enables people to develop the knowledge, values and skills to participate in decisions about the way we do things individually and collectively, both locally and globally, that will improve the quality of life now without damaging the planet for the future.*"
In its conclusions on education for sustainable development the Council of the European Union (2010) established ESD as "*…essential for the achievement of a sustainable society and is therefore desirable at all levels of formal education and training, as well as in non-formal and informal learning.*"

Within the framework of its Proposal for a Global Action Programme on Education for Sustainable Development as follow-up to the United Nations Decade of Education for Sustainable Development (DESD) after 2014 UNESCO (2013) defined ESD it in the following way: "*Education for Sustainable Development allows every human being to acquire the knowledge, skills, attitudes and values necessary to shape a sustainable future. Education for Sustainable Development means including key sustainable development issues into teaching and learning. (...) It also requires participatory teaching and learning methods that motivate and empower learners to change their behavior and take action for sustainable development. Education for Sustainable Development consequently promotes competencies like critical thinking, imagining future scenarios and making decisions in a collaborative way.*"
ESD covers the three pillars of sustainability:
- Environmental

- Social
- Economic

1.1 History and evolution of the ESD

The earliest reference in the field of education for sustainable development can be traced back to 1732: the Dewey's "new three-center theory"; the Bloom's "taxonomy"; the Freire's "conscientization theory"; the "theory of planned behavior"; the Kolb's "experiential learning theory"; the Wittgenstein's theoretical concepts of "language-games," "forms of life" and "rule-following" and the Leopold's "land ethics" laid an early theoretical grounding of educational philosophy and environmental ethics for research into education for sustainable development. The new environmental paradigm and the new ecological paradigm have become the most widely used methodological tools for understanding the values and attitudes of people toward the natural environment. (Zhang & Wang, 2021)

Both education for sustainable development (ESD) and global learning for sustainable development (GLSD) were catalyzed by the UN Resolutions Adopted at the Rio Earth Summit (1992) and by the UN (1992) Agenda 21.

Some of the key highlights in the history and evolution of ESD in formal education, as shared on the UNESCO Chair (2022) website include:

- In **1989**, education, public awareness and training were recognized as crucial means of implementation of sustainable development and were identified in Agenda 21, the action plan of the United Nations Conference on Environment and Development (UNCED) both with the specific Chapter 36 and as crucial elements of implementation throughout the entire document. Chapter 36, entitled "PROMOTING EDUCATION, PUBLIC AWARENESS AND TRAINING" sets out broad proposals, while specific suggestions related to sectoral issues are contained in other chapters of the Agenda 21. The programme areas described in chapter 36 are a. Reorienting education towards sustainable development; b. Increasing public awareness; c. Promoting training
- In **1992**, UNESCO was requested by the United Nations Secretary-General to act as the lead agency for Chapter 36 and in the pursuing years developed the conceptual framework of strengthening and reorienting existing education, public awareness and training systems rather than adding sustainability education as another discipline or discrete subject.
- In **1992**, the first Post-Rio, UNESCO/UNEP/ICC global conference on sustainable development in the context of education and communication - titled 'The World Congress for Education and Communication on Environment and Development (ECO-ED)' was held in Toronto, Canada.
- In **2002**, at the World Conference on Sustainable Development in Johannesburg, South Africa, marking the 10th anniversary of UNCED, nations agreed that more ESD progress was needed. The concept of creating a UN Decade of Education for Sustainable Development (UNDESD) was discussed and endorsed by many nations.

- In **2002**, the UN Decade (2005-2014) was declared through a resolution by the UN General Assembly (2002). It was during the UNDESD that formal education systems, who had to report on their nation's progress, began to take more notice of ESD as part of their responsibility.
- In **2012**, as the Decade was ending, nations called for a continuation of the work begun during the UNDESD and requested UNESCO to develop a continuing strategy.
- In **2014**, at the World Conference on Education for Sustainable Development in Aichi-Nagoya, Japan, ministers of education adopted a declaration containing 360 commitments and calling for urgent action to mainstream ESD and include ESD in the post-2015 development agenda. At this meeting UNESCO launched the Global Action Programme on ESD (GAP) highlighting 5 priority areas for action. The GAP has proven useful in maintaining the momentum of ESD that has now emerged as a crucial implementation element in the Sustainable Development Goals.
- In **2015**, at the World Education Forum, in Incheon, Korea, Ministers of education adopted a global education strategy to implement SDG 4 entitled **Education 2030**. This would be their contribution to the 2030 Agenda and the 17 SDGs. By merging the concepts of Education for All and ESD, as was initially envisioned in Agenda 21, (both initiatives of ESD are   thoroughly identified in the 2030 Agenda as of crucial importance.
- Also in **2015**, at the World Education Forum, ministers approved the yearly publication of the Global Education Monitoring Report (GEMR) which requires nations to make yearly reports on their SDG 4 progress.
- In **2016**, the 2030 Agenda for Sustainable Development was put into effect. Today, ESD is at the core of these 17 SDGs for a sustainable future of our planet and for all. With this international recognition and the adoption of the Global Education 2030 Agenda including its report mechanisms through the Sustainable Development Goal indicators and the GEMR, ESD is poised to gather the attention of both formal and non-formal educators.
- In **November 2019**, the 40th session of UNESCO General Conference adopted a new global framework on ESD called 'Education for Sustainable Development: Towards achieving the SDGs' or 'ESD for 2030'.
- In **May 2021**, this new ESD for 2030 Roadmap was launched during an international virtual conference and supported by the Berlin Declaration.
- In **November 2021** and after a global consultation with more than one million participants, UNESCO launched a new groundbreaking document on how to think about education for the future beyond 2030: Reimagining our futures together: A new social contract for education.

1.2. Objectives of ESD

Education for Sustainable Development (ESD) promotes the development of the knowledge, skills, understanding, values, and actions required to create a sustainable world, which ensures environmental protection and conservation, promotes social equity, and encourages economic sustainability. The concept of ESD developed largely from environmental education, which has sought to develop the knowledge, skills, values, attitudes, and behaviors in people to care for their

environment. The aim of ESD is to enable people to make decisions and carry out actions to improve our quality of life without compromising the planet. It also aims to integrate the values inherent in sustainable development into all aspects and levels of learning.

Usually, as a framework for ESD, the UN's Sustainable Development Goals (SDGs) are used:

- GOAL 1: No Poverty
- GOAL 2: Zero Hunger
- GOAL 3: Good Health and Well-being
- GOAL 4: Quality Education
- GOAL 5: Gender Equality
- GOAL 6: Clean Water and Sanitation
- GOAL 7: Affordable and Clean Energy
- GOAL 8: Decent Work and Economic Growth
- GOAL 9: Industry, Innovation and Infrastructure
- GOAL 10: Reduced Inequality
- GOAL 11: Sustainable Cities and Communities
- GOAL 12: Responsible Consumption and Production
- GOAL 13: Climate Action
- GOAL 14: Life Below Water
- GOAL 15: Life on Land
- GOAL 16: Peace and Justice Strong Institutions
- GOAL 17: Partnerships to achieve the Goal

1.2.1 Promoting awareness and sustainable habits

Simply said, awareness alone will not bring about the kind of impactful and forward movement required to accomplish the SDGs but is the first step. ESD enables all individuals to contribute to achieving the SDGs by equipping them with the knowledge and competencies which are needed to not only understand what the SDGs are about, but to become engaged in promoting the transformation needed. The basic principles behind education for sustainability, which is *"an educational approach that aims to develop students, schools and communities with the values and the motivation to act for sustainability – in their personal lives, within their community and also at a global scale, now and in the future"* (What is education for sustainability, n.d.), as described on the Western Sydney University dedicated webpage (n.d.), are the following ones:

- Transformation and change, in the sense that education for sustainability does not simply and only provide information, but effectively equips people with skills, capacities and the motivation necessary to act as change agents towards sustainability, be it within an organization, a specific industry, or community in general.
- Education for all and lifelong learning, meaning that education for sustainability should not be limited to certain societal groups, but should include people of all ages and backgrounds and at all stages of life, taking place within all possible learning spaces, is delivered both formally and informally, in schools, workplaces, homes and communities.

- Systems thinking, which means that people are educated to understand connections between the different systems - environmental, social, economic, and political – and how these systems interact and influence each other.
- Envisioning a better future via a shared vision, in which all people are engaged and aiming at.
- Critical thinking and reflection, which includes valuing the capacity of individuals and groups to reflect both on their own personal experiences and but also on world views and to be able to challenge accepted ways of interpreting and engaging with the world, when this hinders sustainability.
- The principle of Participation, closely related to transformation and change, according to which participation is seen as critical for engaging groups and individuals in sustainability.
- Last but not least, the principle of Partnerships for change, according to which Education for sustainability focuses on the use of partnerships formed by adequate and dedicated organizations and individuals, building networks and relationships and improving communication between different sectors of society.

Specifically, ESD Target 4.7 of Goal 4 calls for: "*by 2030 all learners acquire knowledge and skills needed to promote sustainable development, including among others through education for sustainable development and sustainable lifestyles, human rights, gender equality, promotion of a culture of peace and non-violence, global citizenship, and appreciation of cultural diversity and of culture's contribution to sustainable development*".

According to the UN Agenda 2030, sustainable development requires universality and aims for global transformation. "*Universality*" means that sustainable development does not only require achieving local economic, social, and environmental goals, but also global challenges, such as climate change or inequality between countries.

While these complex issues must be dealt with by both governments and international bodies to allow appropriate "*transformative*" changes in societies' way of living and protecting the planet, specific measures towards the individual need to be taken, whose behavior must be adapted to meet the specific requirements of sustainability. The impact of individuals' consumption behaviors can be traced back to the growing demand for products and services such as food, water, timber, minerals, and fuel. It is well known that the extensive use of resources as well as environmental damage are to blame for irreversible change of our planet. Household consumption is accountable for more than 60% of global greenhouse gas emissions and between 50% and 80% of total land, materials, and water use (Ivanova, 2016). The Food and Agriculture Organization of the United Nations estimates that one third (approximately 1.5 billion tons) of the world's food is wasted (FAO, 2013). Moreover, it is estimated that the demand for water will exceed the supply by 40% in less than 15 years, as the population increases as well as the demand for resources (UNEP, 2017).

1.2.2. Promoting awareness on sustainable production and consumption

Sustainable solutions have been defined as those that address society's developmental problems in economically viable and culturally acceptable ways, while at the same time maintaining or

improving ecological life support systems (air, freshwater, oceans, forests, and soils), rather than harming or destroying them (UNDP/UNEP, 2013; Wolfensohn, 2013). Sustainable solutions generated at the local level are likely to reflect specific values, aspirations, and capabilities, while those generated at national or global levels tend to be more generic.

Economic sustainability is a broad set of decision-making principles and business practices aimed at achieving economic growth without engaging in the harmful environmental trade-offs that historically accompany growth. Ideally, sustainable development creates operational systems that consume natural capital (also known as natural resources) slowly enough that future generations can also use those resources.

Industrial engineering and manufacturing of products is always accompanied by the extraction and consumption of raw materials from nature and the use of land. Furthermore, pollutants are emitted into the soil, air, and water during the production process and along the entire supply chain. The aim of sustainable production is to ensure that the production of goods conserves resources and preserves the regenerative capacity of the environment. Sustainable products secure the natural foundations of life for future generations. This requires a new approach to research, design, and manufacturing.

Economic sustainability can be achieved through efficient recycling and the use of renewable resources. In the long term, it is important for the whole world and all generations to consider the carrying capacity of the environment. This section looks at sustainable development from the perspective of each economic decision-maker.

Society plays an important role in promoting sustainable economic development. It is important to consider the environmental impact in all investments. To live and prosper, people need products and services (goods). A person produces the commodities needed through the factors of production. The production factors are natural resources, labor, machinery, and equipment (capital). In simple terms, a person (the labor force) produces the goods and services needed from natural resources through capital (accumulated machinery, equipment, and economic capital). When looking at the economic system from the perspective of sustainable development, it is essential that economic activities do not lead to a reduction in social or ecological capital. A sustainable and stable economy provides the basis for all other sustainable development. Without a solid financial basis there is no way to pay wages, invest in the well-being of employees, or in environmentally friendly development. A sustainable economy will also help to meet new challenges, such as rising social security and health care costs due to aging populations.

1.3 Practices in VET and non-VET

"*Sustainable development cannot be achieved by technological solutions, political regulation, or financial instruments alone. It can only be achieved if we change the way we think and act. For this change we need education.*" (Combes, n.d.).

With regards to learning content, the complex sustainability challenges societies face cut across boundaries and multiple thematic areas. Education must therefore address key issues such as climate change, poverty, and sustainable production. ESD promotes the integration of these critical sustainability issues in local and global contexts into the curriculum to prepare learners to understand and respond to the changing world. ESD aims to produce learning outcomes that include core competencies such as critical and systemic thinking, collaborative decision-making, and taking responsibility for present and future generations. In order to deliver such diverse and evolving issues, ESD uses innovative pedagogy, encouraging teaching and learning in an interactive, learner-centered way that enables exploratory, action-oriented, and transformative learning. Learners are enabled to think critically and systematically develop values and attitudes for a sustainable future.

Formal and non-formal education systems in general, and vocational education and training systems in particular play an important role in equipping youth and adults with the skills required for employment, decent work, entrepreneurship, and lifelong learning. Implementing ESD in vocational education can serve as an enabler of transformation by enhancing the sustainability scope of an institutional vision and increasing opportunities to build the capacities of the community and stakeholders in it. ESD in VET provides an enhanced tool to equip youth and adults with the skills needed in the changing world of work, including the knowledge and competency requirements to make the transition to green economies and societies.

The incorporation of green skills in all training courses, as well as the provision of green technology specializations in conventional training courses, would improve graduates' work opportunities. In addition, the change of the working environment brought on by proper occupational actions and awareness of the requirements to be considered would decrease the risk of mistakes in the workplace and occupational hazards. On the other hand, if the teachers or the superiors value the commitment of learners and workers towards greening activities, job satisfaction will increase.

ESD in formal and non-formal education will not only strengthen one industry but the economy as a whole will benefit by well-educated workers who can recognize the environmental demands coordinated in each field of job and will be trained in the related green skill sets. The working environments of the organizations will be better on the grounds that workers will be learning in their vocational training how to act accurately and how to maintain a strategic distance from dangers and harms in the workplace.

A good start to implement ESD in the educational curriculum is to regard the three main domains:

- cognitive domain: comprises knowledge and thinking skills necessary to better understand the specific SDG and the challenges in achieving it;
- socio-emotional domain: includes social skills that enable learners to collaborate, negotiate and communicate to promote the SDGs as well as self-reflection skills, values, attitudes and motivations that enable learners to develop themselves;
- behavioral domain: describes action competencies.

UNESCO publication "Education for Sustainable Development Goals: Learning Objectives"[2] can help educators, experts, school administrators, teachers, and trainers to implement ESD in their curricula by:

- providing orientation on how to use ESD for learning for the SDGs;
- outlining indicative learning objectives as well as suggestions and examples for topics and learning activities for each SDG;
- describing implementation on different levels from course design to national strategies
- supporting education officials, policy makers, educators, curriculum developers and others in designing strategies, curricula, and lesson plans;
- contributing to developing all learners' capacity to contribute to the achievement of the SDGs within their time frame until 2030.

Keywords: *Education for sustainable development, SDGs, transformation and change*

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3

SUSTAINABILITY: CHALLENGES AND OPPORTUNITIES IN THE EU ACCORDING TO THE TREE TRANSNATIONAL REPORT

CHAPTER 3:

SUSTAINABILITY: CHALLENGES AND OPPORTUNITIES IN THE EUROPEAN UNION ACCORDING TO THE TREE TRANSNATIONAL REPORT

Contributing countries:

The Netherlands, Bulgaria, Lithuania, Estonia

Author:

Zinev Art Technologies (Bulgaria)

1. INTRODUCTION

The purpose of this chapter is to present some of the information included in the Transnational report, which serves as a baseline for the work and development of this methodological material. The findings included here are based on the extensive research conducted in all partner countries that are within the project consortium. It can be deduced that the current status, the existing challenges and opportunities, economic needs and further need for improvements align with the objectives of the TREE project.

2. EU POLICIES AND CIRCULAR ECONOMY

According to the national report, the Netherlands has a leading position in the field of circular economy and sustainable procurement by the government itself. Progress is also being made in other environmental themes, but there is also room for improvement. That is the conclusion of the European Union in its biennial Implementation of EU Environmental Policy 2019. The EU calls the Netherlands "an example for public-private cooperation" in the circular economy. The Netherlands national government (Rijksoverheid) supports sustainable economic growth with various subsidy schemes for entrepreneurs. The subsidies for sustainable business can be found on the website of the Netherlands Enterprise Agency (Rvo.nl). According to reports, the number of green public procurement contracts is already higher than the Commission's recommendation. As far as water and air quality and nature conservation are concerned, Europe sees "some progress" in the Netherlands but also "room for improvement".

The country's aim is to create a truly 'circular economy' over the next 30 years, with the stress on using products and materials that can be reused, recycled, and ultimately disposed of in an environmentally sound way. To this end, the government submitted the policy paper 'Netherlands Circular in 2050' to the House of Representatives in 2016. In the follow-up of this policy ambition, the National Agreement on the Circular Economy (Country report on the three priority areas of the UNECEF strategy for Education for Sustainable Development.) has been signed by more

than 300 businesses and social partners like NGO's. At the beginning of 2019, the Dutch Cabinet presented the implementation program for the circular economy. This implementation program presents concrete actions and projects for the period 2019-2023 for the sectors: biomass and food, plastics, manufacturing industry, construction, and consumer goods. Based on the Fifth Dutch National (Fifth Dutch National SDG Report, 2021) in the Netherlands the government prepared document action to promote the long-term development of Dutch industry in the light of developments (Fifth Dutch National SDG Report, 2021) such as sustainability and digitalization. Furthermore, the local and provincial authorities are working on the circular economy (SDG 12) through the Circular Economy Implementation Program.

The Netherlands government (Government on Circular Economy) has set out three goals aimed at making the Dutch economy circular as quickly as possible:

1. Ensure production processes use raw materials more efficiently, so that fewer are needed.
2. When new raw materials are needed, use sustainably produced renewable (inexhaustible) and widely available raw materials, like biomass – raw material made of plants, trees and food waste. This will make the Netherlands less dependent on fossil fuel resources, and it is better for the environment.
3. Develop new production methods and design new products to be circular.

The targets and the overall long-term strategic approach to the circular economy in the country are clear.

When considering Lithuania, since its entrance into the EU, the government followed and integrated European acts and policies on sustainability in its internal legislation. The more relevant documents that in Lithuania integrated measures of circular economy are several, starting from naming the Lithuanian Law on Waste Management, in 1998 ("the main law regulating waste management, including recycling") and the Lithuanian Law on Packaging Management (2001), "which contains information on the use of packaging and the responsibilities of waste treatment organizations" (Grigoryan, Borodavkina, 2017). In 2014 the National Waste Management Plan for 2014-2020 was introduced, "which emphasizes the need to increase the efficiency of waste use" (Grigoryan, Borodavkina, 2017). Following the timeline, in 2015, Lithuania adopted a new development strategy that includes using alternative fuels to increase energy efficiency, revising recycling policy and making production cycles sustainable (Grigoryan, Borodavkina, 2017). In 2016, the government ratified the "National Environmental Protection strategy", that sets out a range of principles and objectives until 2030 about four main axes: sustainable use of natural resources and waste management, improvement of environmental quality, maintenance of ecosystem stability, and climate change mitigation and adaptation (OECD, 2021).

In addition, Lithuania has undertaken two important initiatives on sustainability and the EC:

1. the inclusion of Green Public Procurement (GPP) as a criterion of horizontal sustainability (CircPro interreg Europe, 2020) in the National Progress Programme (NPP). The NPP is the main document that plans the strategic goals to be achieved by 2030, in which it is stated: "we must combine efforts to successfully address the issues of sustainable development, environmental protection, energy, transport, the economy and the building

of democracy" (Council for State Progress, 2012). Based on the recommendations of the European Commission, Lithuania seeks to achieve 55% of GPP from all public procurement by 2030.

2. the project "Roadmap for Lithuania's Industrial Transition to a Circular Economy", an action plan for industrial transformation towards a circular model, implemented by the Ministry of Economy and Innovation in 2019 (CircPro interreg Europe, 2020).

In 2019, the government adopted the National Air Pollution Reduction Plan and presented its long-term National Climate Change Management strategy, setting a net-zero carbon emission target by 2050. This initiative was followed by the 2020 fiscal incentive package, which also contains some investment programmes with environmental goals, improving energy efficiency, promoting renewable energy, and improving the competitiveness of the energy sector. Among the programmes there are the Climate Action Programme and the Multi-Apartment Building Renovation Programme (OECD,2021). It can be stated that Lithuania, similar to the Netherlands, has clear goals that are supported by legislation and government commitment to sustainability.

As an EU member state, Bulgaria has an approach to sustainability aligned both with the Sustainable Development Goals and the relevant EU policies. However, the country is reportedly falling behind in terms of reaching some of the goals set forth.

During the international forum "*Green Transition - Solutions and Challenges for Bulgaria*", organized by Dir.bg and 3eNews (Stefanov, 2021), the Deputy Minister of Economy Ivelina Peneva stated that FLAG Fund is preparing a mechanism for new BGN 200 million for investment projects of the municipalities. According to her, this is underpinned "by the fact that Bulgaria is among the countries most affected by the transition to climate neutrality due to its dependence on fossil fuels and carbon-intensive processes. "*A complete restructuring of the currently dominant linear economic model is needed, and the introduction of circular economy practices is an extremely necessary and important element in this process*". (Tzvetanska, M.,2020). This calls for a fast, but sustainable change.

Furthermore, the National Strategy for Transition to Circular Economy (2020) defines it as a model aimed at extending the life cycle of products. In practice, this means sharing, borrowing, reusing, repairing, and recycling existing materials and products for as long as possible, with the aim of reducing or limiting waste generation. The Strategy was prepared in implementation of measure 589 "*Preparation of a National Strategy in connection with the circular economy package of the Government Management Program of the Republic of Bulgaria for the period 2017 – 2021*" and is aligned with the targets set forth by the European Commission. Furthermore, it is a part of a package of measures of the Government of the Republic of Bulgaria for the transition to a circular economy at the national level and has an implementation period of 2021-2027.

Bulgaria's approach to the circular economy is a long-term one. Within the National Development Program, Bulgaria 2030, the "circular and low-carbon economy" are mentioned as priorities. Currently, the eco-innovation index of Bulgaria is reportedly low compared to other EU states. This is why the Strategy puts a focus on Small and Medium-sized Enterprises (SMEs). In addition, the government has developed The National Strategy for SMEs, which sets out six priorities, one of which is the Environment. With regard to the circular economy measure, the aim of the SME

Strategy is to better integrate SMEs into the circular economy, to improve recycling practices in the largest waste-generating SMEs; more efficient schemes for extended producer responsibility, covering more waste streams, wider use of secondary materials by Bulgarian SMEs, including through industrial symbiosis.

In Estonia, the circular economy is a cross-sectoral principle, which is why cooperation between companies and international agreements are important, creating significant opportunities for the creation of new markets and partnerships. Successful cooperation between companies is well characterized by industrial symbiosis, the aim of which is to achieve a closed production cycle, where the waste, residual heat, or other by-products of one company are used by another company (Ministry of Environment, Estonia).

3. STATE OF THE ART IN TREE PARTNERS' COUNTRIES

When we are considering the state of the art, all 4 countries have provided examples. In the Netherlands, there is at least one organization in each sector that relates to sustainability in one way or another. For instance:

- Dutch Cosmetics Association provides answers to frequently asked questions about (micro) plastic in cosmetics
- Nederland Schoon provides information about trash
- Plastic Soup Foundation14 organizes campaigns against litter, such as World Cleanup Day.
- The North Sea Foundation organizes the Beach Cleanup Tour every year.
- Wageningen University conducts research into plastic in the sea and the influence on animals.
- The Ocean Cleanup is designing and developing clean-up systems to clean up what is already polluting our oceans and to intercept plastic on its way to the ocean via rivers.

In Lithuania, over the past nine years, along with business investment in non-technological innovation, Lithuania's openness to eco-innovation has begun to grow. Since 2010 Lithuania has moved from 23rd to 16th place in the eco-innovation index published by the European Commission, and today it is ahead of its neighbors Latvia and Poland. It is important to note, that the development of the circular economy in the country would also be stimulated by a specialized knowledge dissemination center - a cooperation platform where various stakeholders would have the opportunity to implement joint initiatives, develop inclusive innovations or apply good circular economy practices in their activities.

In Bulgaria, there are currently a couple of examples of "state of the art" projects and organisations related to circular economy, green skills and ESD.

- One of them is the Institute for Circular Economy (ICE), which is a Bulgarian NGO in the fields of circular economy, biomimicry, and regenerative development. As an organisation, the ICE provides consulting services, design excellence and innovation to create products and business models.

- TIME Ecoprojects Foundation Project. As a result of this TIME Ecoprojects Foundation's activity, a report was prepared on the views and motivations of young people on development, as well as initial ideas for the content of the educational packages under the project (P2PChallengePacks). (P2PChallengePacks, information about which can be found here: http://www.poverty2prosperity.eu/bg/pages/
- Most important however is the Innovation and Competitiveness programme 2021-2027 part of the National Strategy. The program was developed in response to the European Green Deal. Among the three main priorities of the Program is the Circular Economy.

In Estonia, there are several examples of "state of the art" organisations related to ESD, Green skills and circular economy.
- FIBENOL Fundamentally rethinking how we use wood.

Fibenol's raw material is forestry and wood industry leftovers. They give new life to secondary-use wood with limited value in the industry and turn it into high-value biomaterials. Fibenol contributes to circular bioeconomy by providing sustainable renewable compounds that could replace high-impact non-renewable inputs for different applications, such as materials, cosmetics and biomedicals production. To support Fibenol's customers to make conscious choices all their products are subject to evaluation of environmental performance also known as Life Cycle Assessment (LCA).

- ACENTO: A complete solution for sustainable events

The full-service partner for events in planning and implementing the entire sustainability and waste area, Acento takes over the management of the entire area so that clients can focus on its core business. Acento complete solution consists of the following: developing a holistic vision and strategy for the sustainability of events, waste reduction planning and the implementation of circular economy principles, implementation, and monitoring of environmental activities during events, etc.

4. QUESTIONNAIRES AND SEMI-STRUCTURED INTERVIEW RESULTS

Questionnaires were distributed within all partner countries, and semi-structured interviews were conducted both with companies and VET teachers. The results have been presented in detail within the National reports. In this section, the summary of results for each of the countries is included.

4.1 The Netherlands

In the Netherlands, this part of the research was conducted in the period January-March 2022. 8 teachers from local VET schools, four NGO's and four companies participated, with a total of 16 respondents.

Findings from all respondents:

- They are familiar with SDGs;
- Their organizations implement sustainability principles and use circular economy principles;
- They wish to find a way to work in a more sustainable way;
- Their organizations have sustainability implementation strategy;
- They mentioned that they are not using the term "green skills" for the job market, but they are all familiar with green skills and competencies related to the CE;
- All respondents agreed on the importance of green skills but added the following to the list: Re-using skills; Visibility; Communication; Cooperation; Sharing; Openness for changes; Innovativeness; Cooperation skills; Volunteering skills.

4.2 Lithuania

In Lithuania, 34 teachers from 5 Lithuanian vocational schools, 18 respondents from companies that apply the principles of sustainability and 4 respondents from NGOs operating in the fields of environmental protection, innovation, CE and others, participated in the TREE project survey conducted by Kėdainiai Vocational Educational Training Center and Public Institution "eMundus" on CE and sustainability.

Below, some of the results can be seen:

1. 44.1% of VET teachers and 54.5% of respondents from companies and NGOs are informed about the circular economy. 9.1% of institutions' representatives are very well informed about the CE. The rest have no knowledge at all or have only heard of this concept.
2. 94.1% of respondents believe that VET institutions can benefit from including a training course on sustainability and the CE in their curricula. According to them, students support the "circular" lifestyle, but do not have established habits to save raw materials and energy, sort waste, and give up consumerism.
3. Respondents (72.7%) from the NGOs indicate that they seek not only to spread the idea of responsible activity, to show and to follow examples, when implementing the principles of social responsibility in Lithuanian business, but also to form the criteria for responsible activities.
4. The most important green skills for the labor market are waste management, pollution prevention and smart thinking.
5. Vocational school graduates are only partially aware of sustainability, the CE and the green skills they need. Science skills and ecosystem management skills are the most lacking ones.
6. Learning about the circular economy and sustainability benefits students in a number of ways: in terms of assessing and changing knowledge, attitudes, skills, personal habits, and in terms of sharing useful information with peers.

7. Training in the circular economy and sustainability should be available through a variety of means (digital, video, paper, etc.) and should be flexible and attractive. They should be carried out through practical activities and the use of digital tools.
8. The plastics and wood sectors are most strongly associated with smart thinking, pollution prevention and waste management skills.
9. 4.5% of surveyed institutions expressed a desire to participate in the TREE project by helping to define green skills and at the same time to run a training course on the circular economy and sustainability.

4.3 Bulgaria

Four NGOs and 1 company, as well as 10 teachers took part in the survey in Bulgaria. Based on the results, it can be concluded that all respondents note the topic of sustainability and the circular economy as very important and relevant today, and green knowledge and skills as essential for future staff in the market labor. Differences are observed in the attitude of business and teachers to the degree of importance of knowledge, business attaches greater importance to knowledge of sustainability and the circular economy, while teachers believe that they are not needed to such a high degree. This makes the project even more important in order to equalize and synchronize the requirements of the business to the staff for knowledge and skills in this new field, the curricula, and the requirements of the teachers to the importance of the topics of sustainability and circular economy.

An interview was also conducted with one of the partner organizations. The main path to be taken in the education of students must meet the needs of today's society in the direction of environmental behavior and sustainability. The respondent identifies the following important guidelines:

- For understanding the concept of a circular economy, it is of key importance to develop knowledge, values, attitudes, leading to positive actions aiming at transition to zero waste.
- Possession of skills for eco-friendly employment opportunities is gaining importance in our times. Therefore, it is necessary that we pay attention to covering the requirements for various positions included in the green economy strategies, because the transition towards such an economy leads to structural changes in the labour markets. The transition mostly affects the already existing professions. The practice shows that vocational profiles in the different sectors change substantially under the pressure of pandemics, digitalization, and globalization, which requires new different skills.
- At present, different programs are providing training opportunities for young people. It is of major importance for the training courses provided to young people, seeking job opportunities, to cover skills and qualifications, which are important for the labour market, including skills, which are relevant to the "green" economy, which are gaining positions in relevance and necessity. Since the probability of young people with low qualifications to be unemployed is greater compared to those who are qualified, the training courses should be focused on providing vocational skills, which can lead to sustainable employment.

- The transition to a circular economy will lower pollution, ameliorate the supply of raw materials, and will intensify the innovations and competitiveness. Such a change has a potential to at least 1% to the GDP of the EU and to create new jobs in Europe. The users will gain access to more sustainable and economic products, which is of great importance.

4.4 Estonia

In Estonia, the survey was also conducted in the period January - March 2022. The results from the survey are based on the responses by 8 teachers and by 4 enterprise representatives.

The results broadly aligned with what was presented by other partners. What is important to note, is that 50% answered that they consider themselves with respect to the Circular Economy Informed to some extent, and 16.6% had just heard about this concept.

5. THE THREE ECONOMIC SECTORS ADDRESSED BY TREE PROJECT

5.1 The plastic sector

The plastic sector, out of the three included in the project, is the one that has seen the most regulations in place and the most attention in terms of sustainability.

The Netherlands' government emphasizes that, with regard to plastic products and packaging and other major material flows (Netherlands Enterprise Agency), efforts are focused on improved design, reuse and recycling. Various collaborations are emerging between waste processors, recycling companies and chemical companies with a view to investing in the chemical recycling of plastics. Large-scale demonstration projects for the conversion of plastic waste into new raw material for the chemicals industry are planned for the upcoming years, with support from the Ministry of Economic Affairs and Climate Policy. In 2020 the Ministry of Infrastructure and Water Management supported chemical recycling through the DEI+ scheme for circular economy and the 'Versnellingshuis', which advises companies wishing to become circular. Furthermore, reportedly bio-based feedstock is already being used on a commercial scale in the production of biofuels. Demonstration projects for new technologies like pyrolysis and gasification of biomass for fuels and chemicals will be set up over the next few years.

In Lithuania, in 2016, the plastic waste production amounted to 88.74 thousand tons and to 68.74 thousand tons in 2017. According to a study carried out in Kaunas in 2021, plastic is the second most used material (after paper and cardboard) in packaging due to its properties, such as low density and thermal conductivity, chemical resistance, transparency, economical production process, etc. (Mickevičiūtė et al., 2021).

It is difficult for companies to replace and find an alternative material to plastic due to its characteristics and costs, and it is even more difficult for citizens, who struggle to reduce the

purchase of plastic products. Reportedly, in recent years, Lithuanian citizens' awareness of the damage caused by plastics has increased: "*in the 2017 Special Eurobarometer 468 on EU citizens' attitudes towards the environment, 88% of Lithuanians said they were concerned about the effects of plastic products on the environment (EU-28 average 87%)*" (European Commission, 2019). In 2016, the Lithuanian government introduced one of the most important regulations contributing to plastic recycling: the National Deposit Return System (DRS) for single-use plastic and glass bottles and metal cans. Large and also small shops have to host "*reverse vending machines*" (there are more than 1,000 throughout the country), which accept used beverage containers and return the deposit paid in the shop in return (0.10 euro per deposit). The packaging collected from the vending machines is sent to recycling centers where the plastic is processed and made into new products (Green News, 2018). The scheme has been a success, with Lithuania having one of the first positions in the EU in terms of recycling.

An interesting initiative implemented to eliminate plastic use is biodegradable plastic, that a group of scientists at Kaunas University of Technology (KTU) has created. The packaging created by the researchers is fully compostable for food products, and it disintegrates with the help of microorganisms.

In Bulgaria, according to the *National Strategy for Transition to Circular Economy* 2021-2027, the production of plastics in primary form in Bulgaria in 2019 amounted to 175 thousand tons, while the production of plastic products is significantly higher and exceeds 500 thousand tons. The significant production of plastic products in the country provides an opportunity for recycled plastics. Bulgaria has made significant investments in recycling plastic and has continued to exceed its capacity for that. A number of companies have emerged within the private sector that deal specifically with that and are growing.

It is fair to say however, that additional efforts are required. Recently, in 2021, the government adopted an Ordinance on reducing the impact of certain plastic products on the environment, which introduces requirements, based on European legislation. Reportedly, measures are being introduced to reduce the consumption of disposable plastic cups and food cans, as well as new requirements for the design and production of certain products in order to reduce their waste and encourage recycling. (Darik News). In addition to that, local companies are obliged to invest 30% of recycled raw materials in beverage containers. Both the pressure from and the information to the consumers has been increasing in the last several years. National information campaigns, collection campaigns with a charitable profile and additional requirements for the expansion of existing systems for collection of packaging waste have really pushed the green agenda.

Restaurants and take-aways have a cap on the use of plastic resources and consumers more and more use reusable bag, separate their waste and focus on products and stores that provide a sustainable alternative.

In Estonia, rubber and plastics products are used in many fields, from the food industry (packaging) to the automotive and building materials industries. The Estonian rubber and plastics industry is made up of about 200 mainly small and medium-sized enterprises. Production becomes more complex and more labor-intensive tasks are replaced by machine work. Mass

production has already partially moved out of Estonia, and companies with a focus on smaller batches have better prospects. (Estonian Plastics Association)

5.2 The agrifood sector

In terms of the agrifood sector, the four partner countries state that it is of great importance for their respective economies, and also acknowledge its complexity in view of sustainability.

In the Netherlands, the value of agricultural exports in 2021 (AgroFood Portal) was estimated at 104.7 billion euros. Wageningen University & Research (WUR) and *Statistics Netherlands* (CBS) report this on the basis of joint research commissioned by the Ministry of Agriculture, Nature and Food Quality (LNV). The growth of agricultural exports is due to both an increase in prices and a growth in export volume. Based on CBS report (*The Sustainable Development Goals: the situation for the Netherlands*) agricultural productivity, the Netherlands, together with Denmark, has been in a leading position in Europe for a considerable time. Since the turn of the century, production volume per unit of labour has risen by more than 41 percent in the Netherlands.

Agriculture is an important area in the Lithuanian economy as it generates 3.6% of the country's GDP, while the entire agri-food sector generates 7.1% of the GDP (Eitfood,2022). What fostered the development of sustainable agriculture were: Lithuania's accession to the European Union (with the introduction of the European agro-environmental rules); documents such as the SAPARD program (Special Accession Programme for Agriculture and Rural Development), training of farmers, Rural Development Plan (2000-2006) and Rural Development Programs (2007-2013, 2014-2020).

The main objectives of the Rural Development Program included the modernization and improvement of the economic performance of small and medium-sized enterprises (with 13 000 farms supported), protection of biodiversity (11 % of agricultural land), improved soil management (8 % of agricultural land), promotion organic farming, the creation of new jobs (more than 2 000) and the development of rural areas. It also provided training for 149 000 people (farmers, owners, managers, food business operators, foresters, and rural SMEs staff) to improve their skills. A series of studies revealed that farmers' understanding and attitudes toward sustainable agriculture improved during the period 2010-2018, but also that they participate in programs on sustainability agricultural practices when supported by higher payments (Mierauskas, 2020).

However, there are still many challenges in the development of sustainable agriculture and several problems such as distrust in the quality of work, low incomes, and lack of collaboration between agribusiness actors need to be more carefully considered. The lack of recognition of the economic benefits of obtaining services and practices on machinery sharing, adequate information on portals and platforms, are crucial points for the achievement of sustainability goals (Ramanauskas et al., 2021). Hence, the main objective of the Lithuanian government is to digitize the entire food value chain at all levels and exploit the potential of agri-food technology innovators based on sustainable agriculture, digital traceability, circular food systems and targeted nutrition (Eitfood, 2022.).

The challenges faced by Lithuanian SMEs in the agri-food sector are numerous: the above-mentioned low level of digitization (the rural areas where they are located have limited access to the Internet), the low incomes of rural farmers, the high cost of ICT infrastructure and the insufficient number of staff to manage it. ICT companies, often located in urban areas, are unfamiliar with the technological needs of the agri-food sector, while the agricultural sector could benefit from ICT to solve multiple problems in various areas, such as irrigation, pesticide and fertilizer application, and crop, soil, and livestock monitoring (Bičkauskė et al., 2020).

In Bulgaria, the Ministry of Agriculture is the governing institution of the sector. It has implemented The Common Agricultural Policy (CAP), which is an integral part of the agreements that established the European Community (EC). The CAP is based on three fundamental principles: free trade within the Community based on common prices, preference for Community produce in Community markets, and joint financial responsibility.

The Vision of the Republic of Bulgaria for CAP after 2020 concludes with the following goals:

- to maintain its character as a common EU policy, including in its financial dimension;
- to ensure food security and the health of citizens;
- to ensure the sustainability and competitiveness of agriculture;
- to ensure a level playing field for all farmers in the single market;
- to promote the socio-economic cohesion of rural areas;
- to support the development of small and medium-sized agricultural holdings;
- be simple and understandable for beneficiaries and European citizens;
- be environmentally friendly, promote the efficient use of natural resources and measures to combat climate change

The last goal is of particular importance not only for the TREE project, but for the sector as a whole. Currently, based on the results of research on the environmental sustainability of Bulgarian agriculture through a wide range of criteria, the sector is at a good level (Mitova, D. 2021).

According to a recent report, Bulgarian farmers forecast weaker yields, with lower quality, and hence lower incomes, as a result of the new green policies of the EU. At the heart of their concerns is the significant reduction in the use of pesticides and fertilizers by 2030, writes EURACTIV Bulgaria. The Bulgarian Ministry of Agriculture told at the end of 2020 that it received recommendations for the reduction of pesticide use from the EC. The analysis of the economic effects has not yet been shared and there is insignificant information in terms of measures that would be implemented.

Another aspect of agrifood and its relations to sustainability is food waste. In Bulgaria, reportedly the total amount of food waste generated is significant - about 500 thousand tons. Bulgaria is now in the process of preparing a National Program for Prevention and Reduction of Food Loss, which will cover all stages of the food chain: primary production; processing and production; retail and other distribution; restaurants and catering services; and households.

A key aspect is biomass energy production. Currently, in the country, its production exceeds 1 million tons, which represents over 10% of the total energy consumption in the country, according to statistics listed in the Strategy document. Households consume 70% of the energy produced from biomass. However, according to the National Strategy for transition to circular economy, there is a very large untapped potential in the recovery of solid agricultural waste from corn stalks for grain, sunflower and others, which is estimated at over 2 million tons per year. ("ENVIRONMENT 2014 - 2020" Strategy for Transition to circular economy 2021-2027: Project 2020). This shows the potential for development and the integration of a sustainable and profitable practice within the sector.

Estonia has the third highest share of organic farming in the European Union and is one of EIT-Food's RIS countries. Despite the demanding climate conditions connected to geographical location, Estonia possesses environmentally clean and fertile soil, which is reflected in local produce containing considerably less chemicals and growing popularity of organic farming. According to publications by EitFood on the status in Estonia, the country possesses environmentally clean and fertile soil, which is reflected in local produce containing considerably less chemicals and organic farming gaining popularity. Out of 957 510 ha of farmland of Estonia, 15.7% of it constitutes organic farming, which is the third highest share of any EU country (Eurostat, 2014). A strong emphasis is put on high nature value and agri-environmental issues, with 16.5% of the country defined under NATURA 2000 (including 55,000 ha of farmland) (EitFood, Estonia). There is, however, similar to the other countries in the consortium room for improvement.

5.3 The wood sector

Based on the research presented within the National Reports, the wood sector in each of the partner countries is at a different state of development and sustainable approaches' implementation, despite its importance both in terms of economy and environment.

Approximately half the forest area in the Netherlands has been certified for sustainable forest management (System Transition Wood Construction NL, 2020). In recent years, the amount of timber in the woodlands has increased steadily, due to reduced harvesting activities.

Wood is an important renewable resource, which is neutral in terms of carbon dioxide emissions, however, in the policy paper "*Nature for people, people for nature*" in which the Dutch nature conservation policy is described in detail, and in which the forestry policy is included, wood production and timber harvesting are not mentioned explicitly. (Dutch Timber Platform, Ministry of Agriculture)

Reportedly, by applying a systemic whole supply chain transition approach, the Netherlands hopes to achieve a 30% increase in the use of wood in housing and office buildings in the Netherlands within ten years. Currently, there is a project in place that aims at achieving these targets by mobilizing up to 100 different partners from governments, companies, advisories, and NGOs to achieve an annual carbon saving of a minimum of 5% of the Netherlands' yearly carbon footprint. No fewer than 23 parties are joining forces with the Covenant on 'Promoting sustainable

forest management' to make wood from sustainably managed forests commonplace in the Netherlands. In addition to the ministries, 13 branches in the timber, construction, furniture, and retail chain, FNV, CNV and 7 civil society organizations have signed the Covenant.

Forests are essential for the ecological stability of Lithuania for their role in ensuring a high air, water, and soil quality. Currently, according to the national statistics, the land devoted to forests occupies 33.7% of the area of the country and generally the condition of the habitats of the rarest species is poor. In Lithuania over 60% of forested land belongs to the State, while 40% is owned by private individuals and companies.

The Lithuanian Forestry Law stipulates that the general volume of all annual forest cuts cannot exceed the gross annual increment of trees. The volume of main annual forest cuts in State's forests is kept under control by the government, while this volume becomes higher in private forests that are more price-sensitive (USDA, 2017).

Statistical information on the wood production sector does not present a complete picture of the timber market in Lithuania, and the freely accessible published data are outdated. This is because the wood products industry "*is adverse to sharing information or promoting its potential and business opportunities*". The fastest growing segments of this sector are the furniture and paper industries. The Lithuanian Statistical Office shows that *"the furniture industry is one of the most important manufacturing industries in Lithuania, after food and beverage production"* (USDA,2017). In fact, over 30% of the jobs available throughout the Lithuanian manufacturing industry are provided by the furniture and wood processing industries.

Foreign investments have also contributed greatly to the development of the sector: Scandinavian companies,(especially IKEA), are the main players in the Lithuanian furniture market. Statistics show an increase in furniture sales linked by exports, with a good foreign trade network, but also furniture imports are significant (USDA, 2017).

Lithuania has transferred its district heating (the district heating system generates heat in a centralised location and distributes it amongst multiple different buildings), which accounts for 40% of the country's energy consumption, to 70% of energy from biomass. Lithuania actually is one of the leading consumers of renewable energy in Europe, with 34% of all energy consumption from renewable sources (Zachary, 2021). In this context, wood chips have become the most important commercial product for energy production, and their quality has become a subject of study. (Pedišius et al., 2021).

In Bulgaria, the wood sector is marked with challenges. According to the results of a project conducted in 2018, the forest territories of Bulgaria occupy 4,148,114 ha or 37.4% of the country's territory. The state ownership over the forest territories prevails - 74.5% of their total area. (Chobanova, R, Kotzarev, L., 2018). According to the same report, as well as numerous news articles and other official reporting, illegal logging and poaching are one of the most important problems related to the protection of Bulgarian forests. For the period 2005-2010 the average annual growth increased from 14.1 to 14.4 million cubic meters of wood. (Chobanova, R, Kotzarev, L., 2018) This is due to issues of "grey economy', insufficient funding and control

measures. Companies are not held liable, and numerous individuals also exploit this resource without adhering to the set-out regulations.

Another issue related to the wood sector reportedly is the fact that due to forests' locations, landscape and problems with infrastructure that does not allow the movement of timber, there is an "excessive use of wood" in certain areas with a disregard to the effects on the environment.

According to the National Strategy for Development of the Forest Sector in Bulgaria, 2013, some of the main challenges to the development and sustainability of the sector are:

• low labor productivity;

 • difficult access to funding;

• lack of opportunities to use funds from the EU structural funds to invest in the renewal of equipment in logging, machinery, production lines and transport of forest products;

• insufficient participation (support) by banks in investment projects;

• low share of certified forest areas and certified forest entrepreneurs.

Although the sector provides opportunities and can be developed in a sustainable and profitable manner, the required actions have not been taken. The sector is directly related to the construction sector, which is quite prominent in Bulgaria, as well as to the energy sector.

It is clear that there is both a need and interest in moving the sector to a "greener" exploitation, but adequate and sustainable steps are yet to be taken.

Estonia is a country rich in forests – over a half (51.4%) of its mainland is covered with mostly semi-natural forests. The area and reserve of forests has increased significantly during the last half-century. In Estonia, forest grows on approximately 2.3 mln hectares, of which approximately 75%, that is, 1.7 mln hectares is manageable forest. The total growing stock of stands is 480 million m3.

The importance of forests is manifested in four aspects:

- economic – forest as a source of revenue;
- social – forest as an insurer of employment and provider of forest vocation;
- ecological – forest as a preserver of population diversity;
- cultural – forest as a part of Estonian culture.

The management of Estonian forests has not been consistent due to historical reasons and that influences the state of the forests as well as the choices they have today.

According to the Ministry of Environment in Estonia, the role of forestry in the economy and social life is extremely important: the sector's direct, indirect and induced contribution to the GDP is around 10%. Wood and wood-based products are an important part of our trade (balance). It is one of the most important sectors in terms of export; furthermore, export includes predominantly products of higher value – for example wooden houses.

It has been estimated that about 5-6% of the occupied workforce in Estonia is directly linked to the forestry sector. This number, however, excludes different indirect effects that the sector has e.g. to transportation, nature-based tourism etc. - which means that the overall impact is even higher. Also from a regional perspective even more so, as most of these jobs are situated in rural areas (Forestry, Ministry of Environment, Estonia).

6. CONCLUSIONS

Based on the information provided by the partners in the consortium in their national reports, it can be concluded that both sustainability and circular economy are firmly on their respective government's agenda. Significant steps have been made in terms of related legislation, economic incentives and regulations that aim achieving long-term goals. Further commitment, education, business, and consumer practices will be vital for the achievement of these goals. The results from the surveys and the research show that there is interest and need for change and improvements. The reviewed sectors also show a gap that needs to be addressed. Hence, the objectives of the TREE project are aligned with the existing needs and will help support the transition to a "greener" future.

Keywords: *Circular economy, sustainable development, policies, national strategy*

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4 "GREEN" SKILLS DEFINITION IN TREE PROJECT

CHAPTER 4:

"GREEN" SKILLS DEFINITION IN TREE PROJECT

Authors:

Aurima Bajorūnienė, Olga Zaborskienė, Alma Valonienė, Dalia Sapronienė, Rusnė Feiferienė, Žilvinas Kapočius, Kėdainiai Vocational Educational Training Centre (Lithuania)

Relika Alliksaar Williams, Valga County Vocational Training Centre (Estonia)

1. INTRODUCTION

Famous dramatist Tom Stoppard (1972) said that skill without imagination is craftsmanship and gives us many useful objects such as wickerwork picnic baskets; imagination without skill gives us modern art. Skills are performance abilities formed by repetition that approach automation, and skill repetition is the ability to perform an action automatically.

Any new mode of action, initially occurring as a self-contained, developed, and conscious, and later due to many repetitions, can already be performed as an automatically performed component of an activity.

An essential part of a skill is a procedure that requires minimal conscious effort and is stored in procedural memory. Unlike habit, skill, as a rule, is not associated with a steady tendency to actualize under certain conditions. The concept of skill is included in the triad: knowledge - abilities – skills.

Skills classification: motor (motor), intellectual and perceptual skills.

- Motor skills - an automated effect on an external object with the help of movements to transform it, repeated over the past.
- Intellectual skills - automated techniques, ways to solve previous mental problems.
- Perception skills - an automated sensory reflection of the properties and characteristics of well-known objects that have been perceived many times before.

Samuel Johnson (1751) noted that few things are impossible to diligence and skill. Great works are performed not by strength, but perseverance.

As skills are learned through repetition, they can be constantly improved. They can be compared and assessed. They are diverse: social, verbal (linguistic), psychological, professional, and so on.

Shinichi Suzuki (2009) said that knowledge is not skill, as there's a difference between these concepts. In order to pursue a profession, we try to accumulate as much professional knowledge and acquire the necessary skills in preparation for it. But nowadays, it's not just knowledge that matters. Professional skills alone are sometimes not enough for a person to do their job successfully, as employers demand more. They need competent professionals in their field with a wide range of skills.

Green skills are the skills needed by all sectors of the economy and at all levels of the workforce to adapt to climate change by changing the eco-requirements of products, services, and processes. Climate change, environmental degradation and biodiversity loss are major global challenges affecting our way of life and our society.

Our planet's resources are limited, and today we extract and consume more than it can sustainably provide for us. By using natural resources, we produce and use value and jobs, thereby improving our quality of life and well-being.

Everything around us comes from nature. In one form or another, our homes, cars, bicycles, food, clothing, and energy have been and will be part of our environment. We extract raw materials, process them, and build our society. This connection and dependence on the environment around us have always been important to our existence.

2.   DEFINITION OF "GREEN SKILLS"

Green skills are the technical skills, knowledge, values, and attitudes required of the workforce in order to develop and support sustainable social, economic, and environmental outcomes in business, industry, and society, with the goal to reduce human activity's negative impact on the environment

Environmental literacy refers to society's collective knowledge, capacity, values, and attitudes required to live in, create, and sustain a society that lowers human activity's environmental impact. These general green skills include the ability to incorporate environmental considerations alongside others (e.g. performance and safety) in decision-making, including the choice of processes and technologies.

Green skills can be divided into two broad groups:

- Skills related to your professional field - needed to create and promote green jobs that can contribute to a greener transformation of the whole sector represented. According to the New Industrial Strategy for Europe (European Commission, March 2020), green skills are needed to develop the skills of workers and transform them for the future.
- General green skills for everyday life - everyone needs to be prepared for the impacts of climate change and to be able not only to cope successfully but also to contribute to slowing climate change.

Green skills are generally composed of three dimensions, namely knowledge (the cognitive dimension), skills/abilities (the psychomotor dimension) and attitudes/values (the affective dimension), which employees need to contribute to sustainable development in the society, the economy, and the environment.

Green skills equal a green lifestyle. To promote a greener, more economical lifestyle, start with small steps, such as:

- Think about and implement ways you can save resources (water, electricity, paper, packaging, etc.) in your daily life;
- Avoid unnecessary car journeys - plan routes and things to do, use public transport or cycle, walk shorter distances;
- Give a second life to things that are meant to be thrown away - donate to charity, repurpose,

sort waste.

2.1. Importance of Green Skills

Climate change and environmental degradation are an existential threat to Europe and the world. To overcome these challenges, the European Green Deal (2019) will transform the EU into a modern, resource-efficient, and competitive economy, ensuring:

- no net emissions of greenhouse gasses by 2050
- economic growth decoupled from resource use
- no person and no place left behind

The aim of green skills is to adapt processes, services, and products to climate change and the environmental regulations and requirements it brings. These skills include the knowledge, abilities, values, and attitudes necessary to live in, develop, and support a sustainable and resource-efficient   society.

Table 1. Ten actions to help tackle the climate crisis.(Source: UN, 2020)

Save energy at home	**Walk, bike, or take public transport**
Eat more vegetables	**Consider your travel**
Throw away less food	**Reduce, reuse, repair, recycle**

	Change your home's source of energy		**Switch to an electric vehicle**
	Choose eco-friendly products		**Speak up**

2.2. Green skills according to the TREE project

The aim of the TREE project is to help educate people to understand the importance of small steps making a big difference in the big picture. It is always smarter to use less and waste less – there is no need to overuse anything. And that's why we now have recycling, circular economy, green skills, green technology, and green economy etc. It is all to sustain life on planet Earth.

During the 20th century scientists proved that CO_2 emissions are causing global warming. Nowadays we all have to take actions as defined in the European Council document "Fit for 55".

Our everyday choices and actions as habitants of planet Earth have a big environmental impact. So, it is important to know and to be aware of the basic principles of nature protection, such as carbon footprint and to pay attention to our daily habits (how we move around, how and what we eat and wear, how and what we do with our waste, how we heat and cool our living and workspaces – our daily habits everywhere).

Small changes in the right direction will make a big difference in CO_2 emissions and climate change.

Climate change proofs we see in Europe are heat waves, big rains and extreme floods, colder winters than before. And in other continents we see mega rain and floods that are affecting the lives of too many people.

When every individual makes an additional effort to minimize their CO_2 emissions, we all will help to achieve the goal set by the European Commission to make Europe the first climate neutral continent in the world. Climate change is the biggest challenge of our times.

3. HOW TO PROMOTE GREEN SKILLS IN VET SCHOOLS

Nowadays, people talk about green elements which include green economy, green development, green communities, green urbanization, green education, and others related to sustainability. To establish a sustainable life, every individual should take care of the environment. Imparting green skills to students needs to be done from a very young age to ensure that the human capital and leaders of the country have the right attitude towards, and awareness of the importance of balanced environmental developments in all aspects of life.

Environmental learning was first introduced in the education system because of concerns for the environment and to develop it in a sustainable manner. It also aims to develop the awareness, skills, knowledge, attitudes, values, understandings, and commitment, which hopefully will help solve environmental problems in order to achieve a better quality of the environment (Sola, 2014).

3.1. Demand for Green skills

Rapid growth of the green technology industry is not only important while searching for the development of the green economy: it also leads to a future employee who has a high awareness of environmental issues.

Green skills are becoming obligatory for employers along with conventional hard and soft skills. Green skills development becomes essential for a healthy and smooth transition to a green economy.

Green skills in all updated education and training programs must be included into the new curricula of general education and VET schools.

Each profession must consider its specific environmental aspects. While skills needs are connected with the greening of the economy, especially in specific sectors such as energy and resource efficiency, construction and manufacturing, the transition to green skills in the circular economy (CE) appears in a wide range of industries. Such new skills need to be integrated into a wide range of education sectors, including the provision of vocational education and training, from initial vocational education and training to continuing vocational education and training, as well as apprenticeships.

These new green skills can cover a range of skills, from highly technical and job-specific skills to more social-emotional skills, such as responsible use of resources, which can be relevant to different professions, levels of hierarchy and sectors.

Public policy, together with private initiatives, can foster expansion of green transformation and harness energy efficiency and renewable energy potential, all of which requires transformation of the skills base.

Skills development responses need to focus on adding to existing competences, emphasizing core skills, for all levels of skill needs. Every job has an opportunity to become greener. Understanding the environmental impact of a job, and its possible contribution to greener economies, needs to be integrated into education and training systems. Integrating sustainable development and environmental issues into existing qualifications and capturing new and emerging skill needs on the greening job market is a difficult and complex task.

Green jobs are jobs that reduce the environmental impact of enterprises and economic sectors, ultimately to levels that are sustainable. The ILO defines green jobs as work in agriculture, industry, services and administration that contributes to preserving or restoring the quality of the environment while also meeting requirements of decent work: adequate wages, safe conditions, workers' rights, social dialogue and social protection.

The transition to greener economies requires a different type of professional (e.g., architects and engineers) as well as vocational (mechanics and technicians) workers. Environment and sustainability-related courses need to be integrated into the curricula for vocational training. Countries need to create the green growth knowledge base such as launching national education initiatives for green and climate-resilient development and possibly a national climate education clearing house of knowledge.

The implementation of the principles of the green economy identifies four main categories of competencies that are important in the context of the green economy.

- *Cognitive competences.* Understanding the environment, the desire to learn about sustainable development and new technologies. These skills are needed to assess and understand the need for innovation and change.
- *Social competences.* These are coordination and business management skills - combining economic, social and environmental goals; communication and negotiation skills - reconciling conflicting interests in a complex context;
- *Green marketing competences.* Promotion of greener products and services.
- *Personal competences.* These are adaptive skills, transferable skills to help employees learn and apply the new technologies needed to 'green' their work, and entrepreneurial skills to tackle innovative technologies.

The employment effects of the green transition in other sectors tend to be complex. Manufacturing, notably the automotive sector, is gradually changing its output to produce more energy-efficient products, with limited net employment gains; it is also producing green products and creating jobs in supply chains (for example in the production of wind turbines). Agriculture, though subject to significant green challenges and a very important source of employment in most developing countries, does not appear to date to have undergone significant changes in skills. The potential for green jobs in transportation and tourism is yet to be fully realized but is attracting considerable attention in some countries in achieving sustainable development.

Table 2. Changes in skills by occupations (Source: ILO, 2019b.)

Skill level	Nature of change	Typical skills response	Typical skills response
Low-skilled occupations	Occupations change in a generic way, e.g. requiring increased environmental awareness or simple adaptations to work procedures	On-the-job learning or short reskilling and upskilling programmes	Refuse/waste collectors, dumpers
Medium-skilled occupations	Some new green occupations Significant changes to some existing occupations in terms of technical skills and knowledge	Short to longer upskilling and reskilling programmes; TVET courses	New occupations: wind turbine operators; solar panel installers Changing occupations: roofers; technicians in heating, ventilation and air conditioning; plumbers
High-skilled occupations	Locus of most new green occupations Significant changes to some existing occupations in terms of technical skills and knowledge	University degree; longer upskilling programmes	New occupations: agricultural meteorologists, climate change scientists; energy auditors, energy consultants; carbon trading analysts Changing occupations: building facilities managers; architects; engineers

3.2 Skills Development for Green Jobs

Skills shortages for green jobs could have an impact on government efforts toward green growth and targeted environmental outcomes. During a skills shortage situation, governments address an existing job-skills gap during a transition to a green economy that needs the state to become partners with industries and employers. Companies have to shift to a more holistic perspective supportive of sustainable development. Together with the investment in skills upgrading, companies must also provide their managers with the mandatory reorientation and training to develop awareness and capabilities to sufficiently utilize the staff/workers' newly acquired skills (UNEP 2011). Overall, skills development strategies for renewable energy will be outlined because of the following broad processes:

3.2.1 Aligning Skills Provision Strategies for Green Jobs with National Development Policies

Public and personal sector investments in skills provision for green jobs should be aligned with and supported by sustainable development and other enabling policies. Skills development outlined in green policies should be in synergy with strategies to extend labor capital, worker education, and labor productivity (World Bank 2012). Special focus and investment in science, technology, engineering, and arithmetic (STEM) must be highlighted to retort to the present and anticipated demand within the renewable energy sector for R&D and engineering occupations, among others. At the outset, an intensive review of existing skills development policies should be finished, the tip visible of aligning education and TVET with green growth policies.

3.2.2 Assessing Skills Requirements for Green Growth

It is equally important to agree on high priority and investments in determining and forecasting the development of skills needed to inform assessment of and any adjustment in occupational skills profiles and training programmes. The results of skills need assessment should enter the labor market information systems to support strategies to match skills supply and demand in renewable energy and green jobs in other key
sectors. Also to encourage increase within the supply of trainers, social dialogue, and advocacy with education and training institutions, industries, and every stakeholder in evaluating and planning for renewable energy skills development must be conducted.

3.2.3. Skills Acquisition and Enhancement

In transitioning to a green economy, skills development programs must provide for (i) retraining, upskilling, or adaptation training of existing workers for enterprises across sectors like infrastructure, agriculture, and manufacturing; and (ii) training of workers and producing skilled workers and professionals, especially in sectors directly associated with renewable energy sector. A variety of skills, even knowledge of sustainable materials, skills connected to carbon footprint, and environmental impact assessment, might not be purely "green".

They become green largely betting on the context wherein they are used. Skills in building construction become green after they are utilized in the creation of energy-efficient buildings. In impact assessment they become green when the results help create more resource-efficient knowledge, practices, or products. This suggests that traditional skills will remain relevant within the context of green growth, but must be adapted to green practices, for instance, new knowledge and practices in energy efficiency, when applied in green jobs and enterprises.

While skills development strategies for green jobs will vary depending on the country and specific industry, most emerging jobs in a green economy will need to combine traditional and green skills. In most cases, it should be more practical to retrain or enhance the abilities of workers instead of to switch to the new ones. For low- to middle-skills jobs, traditional skills will be easily supplemented by green skills through on-the-job training programs. This may also largely depend upon reorienting the content of the jobs and also the way they are performed. For high-skills occupations, more extensive and intensive education and training programs may be required to enhance traditional technical skills with a wider and specific set of green skills (ILO 2011a; UNEP 2011).

3.2.4 Qualifications framework.

The existence of a qualifications framework (QF) can facilitate integration of green skills in education and training programs and curricula or modules. A study in 2016 explored how green skills were integrated in green jobs in Thailand's construction and tourism industries. The most essential strategy is to retrain workers with a collection of well-defined green knowledge and skills developed through the promotion and implementation of green competences.

The initial step is to develop a collection of green skills competencies (knowledge and skills) specific to an occupation within the tourism and construction industries. Samples of occupations in these fields are electricians, carpenters, plumbers, and tourism operators (Esposto 2016). Since a QF essentially links qualifications with the particular skills needed in a certain workplace, green skills may be translated into specific competences that can feed into competency-based training modules or curriculum designs, furthermore as into assessment and/or certification mechanisms. Integration of green skills within the QF would also allow for workers' mobility across green jobs and sectors.

3.3 Good practices in VET schools, non-formal teaching, and companies

Learners of all ages need to be able to develop the knowledge, skills, and attitudes to live more sustainably, change patterns of consumption and to contribute to a greener future. Education and training have a key role to play in supporting people to move from awareness about the environment to individual and collective action.

A growing number of initiatives and actions on climate change, biodiversity and sustainability are taking place across Europe in education and training. However, despite progress and growing public interest, learning for environmental sustainability is not yet a systemic feature of education policy and practice in the EU.

The food production, catering, transport services and textile sectors have a significant impact on the environment and can contribute to sustainable development by implementing the principles of the circular economy (CE). Therefore, an employee with theoretical knowledge of the principles of the CE, resource reuse and recovery of raw materials would be prepared for the labor market. Taking this into account, the Panevėžys Labor Market Training Center plans to integrate the topics of the CE into the subjects and provide students with as much information in this field as possible, how to organize activities to minimize waste and how to use the remaining raw materials and waste.

Analyzing the magnitude of the environmental impact of meeting the goals of the CE, the researchers say that, in terms of the value of all textiles and clothing, textile waste generated during and after consumption poses the greatest environmental challenge. The problems of managing this waste are also of concern to the whole European Union, as the EU textile and clothing sector, which plays an important role in the development of the EU circular economy, is mainly concentrated in Romania, Bulgaria, and Lithuania.

The study shows that so far very little textile is repeatedly used in the Lithuanian local market - it is in strong competition with imported second-hand products. Most textile waste is disposed of together with mixed municipal waste. For example, in 2018. in the country amounted to 64.6

thousand. t of textile waste, of which as much as 51t has been landfilled or incinerated. As a result, about 7.9 thousand people were released into the ambient air. kg of carbon dioxide.

European requirements for the management of textile waste have not yet been established, but the European Commission has already started work on an EU Textile Strategy, which is expected to be adopted by the end of 2021. The Waste Policy Group of the Ministry of Environment will also be actively involved in the work of the working groups set up to develop this strategy.

Teachers and students from general education and VET schools in Estonia, Bulgaria, Lithuania, and the Netherlands from year to year actively participate in various international, national and regional projects, conferences, seminars, events and initiatives, connected with circular economy (CE), sustainable development and other environmental issues. Examples of good practices selected by the TREE project partner institutions (S.A.F.E. Projects, Netherlands; Zinev Art Technologies, Bulgaria; Profesionalna gimnazia Asen Zlatarov, Bulgaria; VšĮ „eMundus", Lithuania; Kėdainių profesinio rengimo centras, Lithuania; Valgamaa Kutseoppekeskus, Estonia) are presented below (See Tables 3, 4, 5, 6, 7 and 8).

Table 3. Example of Good Practices selected by Valgamaa Kutseoppekeskus, Estonia.

1	Title	Electrical safety training for electric and hybrid drive technicians.
2	Country	Estonia
3	How is it promoted?	- as a part of a VET school curriculum *https://vkok.ee/et/taiendusoppe-toetused/tasuta-koolitused-2#tasuta_koolitused*
4	Context of implementation	The context where the best practice was developed: ☐ large city ☒ small city ☐ village
5	Goals of the activity	Skills / training needs identified in the OSKA COVID-19 special study in the field of motor vehicle repair and maintenance: ● Retraining of technical staff to improve and maintain skills and exit from the crisis and further development in the 10-year view of the green revolution table leveraging future growth in the repair and maintenance of hybrid, gas and electric vehicles. The OSKA report in the field of transport and logistics states: ● Due to global trends and developments in the field, the following field-specific skills are becoming increasingly important: the ability to work with different motor vehicles or technical systems; knowledge of diagnostics of motor vehicles and technical systems. ● In the field of motor vehicles, the growing share of electric and hybrid cars is affecting labor and skills needs. ● In the maintenance and repair of motor vehicles, new types of vehicles (electric, hybrid) will certainly affect the need for skills.
6	Description	A detailed description of the practice (500 words), describing: a. The activity was relevant to the topic of ☐ circular economy (CE), ☐ education for sustainable development (ESD), or ☒ both CE and ESD

		b. Main Steps (what was the preparation, what activities the participants went through, what were the results) ABC of Electric and Hybrid Vehicle Safety Electrical Safety Standards and Legislation Maintenance and Repair of Electric and Hybrid Vehicles Electrical Hazards and Accidents Hazards Related to Battery Chemistry and Magnetism Tools, Fuses, and Warning Signs Accident Response and First Aid Policies and a hybrid car repair company. Activities were held in the classroom with projectors, computers and wiring diagrams, electrical and with demonstrations on hybrid and battery technologies. Other part was a practical training workshop with electric and / or hybrid cars and the necessary tools for safe work. Training took place on very new and good electrical stands - simulating real life situations.
7	Implementation choices	a. Target groups Employee of a motor vehicle maintenance and repair company. b. Other participants in the activity, besides the promoter and the target groups (did it take place in cooperation with a company, other VET providers or an NGO) The training took place at VKOK and was open for mechanics who are not studying at the school. c. Duration – 52 academic hours d. Number of sessions/activities - volume of classroom work in academic hours: 36 (study in the form prescribed by a lecture, seminar or other school) volume of practical work in academic hours: 16 (application of learned knowledge and skills in the learning environment) e. Teaching methodology, if applicable f. Type of assessment and tools used to identify the benefits g. Studies are considered completed if the student has acquired the learning outcomes of the specialty curriculum at least at the threshold level and participated in the studies at least 70%. The achievement of learning outcomes is assessed on the basis of a written test (at least 70% correct answers) and the correct completion of practical tasks. Learning outcomes are assessed in a non-discriminatory way. A certificate is issued to a student who has acquired the learning outcomes and passed the assessment. 5. Trainer Training was created during Covid-19 pandemic, it was as a result of OSKA - OSKA applied research surveys helps to learn and teach the right skills. OSKA is a professional body, government agency under the Ministry of Education and Research. OSKA analyses the needs for labor and skills necessary for Estonia's economic development over the next 10 years.
8	Green skills targeted by the good practice	The green skills (see detailed explanations for each green skill after the end of this form), which the practice contributed to A) theoretically

		B) practically

		☐ Creative problem-solving A ☒ B ☒
		☐ Forward-thinking A ☒ B ☒
		☐ Monitoring skills A ☒ B ☒
		☐ Analytical skills A ☒ B ☒
		☐ Management skills A ☒ B ☒
		☐ Impact quantification skills A ☐ B ☐
		☐ Life-cycle management skills A ☒ B ☒
		☐ Lean production skills A ☒ B ☐
		☐ Maintenance and repair skills A ☒ B ☒
		☐ Science skills A ☒ B ☒
		☐ Waste management skills A ☒ B ☒
		☐ Environmental auditing skills A ☒ B ☒
		☐ Ecosystem management skills A ☒ B ☐
		☐ Pollution prevention skills A ☒ B ☐
		☐ Eco-Design skills A ☒ B ☐
		☐ Other, please, specify: _____
9	Materials/equipment	The materials/equipment required for carrying out the activities of the good practice Computers, projectors in classroom, computers, and wiring diagrams, electrical and with demonstrations on hybrid and battery technologies. Training workshop with electric and / or hybrid cars and the necessary tools for safe work.
10	Who runs the activity	☒ a person ☐ an organization/institution ☒ a VET school ☐ a company/enterprise ☐ an NGO ☐ other (please, describe)
11	Benefits and results	a. The benefits of this best practice for the target groups b. Learning outcomes are described as competencies that specify what knowledge, skills and attitudes a learner must acquire at the end of the learning process - the learner properly secures the electric car before starting work; c. the learner knows the proper electrical safety of the standard SFS6002, which also meets the requirements of the standards EN50110-1 and EVS-EN50110-1; Motor Vehicle Technician, Level 4 A.2.1 General motor vehicle diagnostics, maintenance, and repair; link to a vocational standard or curriculum - Motor Vehicle Technician, Level 4 A.2.1 General motor vehicle diagnostics, maintenance and repair d. Community/social/economic impact

12	Relevance for the TREE Project	a. Related to one or more of the priority sectors (plastic, agrifood, wood) Related to green technologies, safety, raising awareness of the dangers of performing maintenance of electric vehicles. b. Involves micro- and project-based learning practices (list and mention how)
13	Website E-mail Other contact info References	Any references listed, should be cited by using the APA referencing style *https://libguides.murdoch.edu.au/APA#:~:text=The%20APA%20referencing%20style%20is,and%20the%20year%20of%20publication*

Table 4. Example of Good Practices selected by Profesionalna gimnazia Asen Zlatarov, Bulgaria.

1	Title	Transition to circular economy through composting in households and in pilot schools in the municipality of Etropole
2	Country	Bulgaria
3	How is/ was it promoted?	- within the framework of a national project
4	Context of implementation	The context where the best practice was developed ☐ large city ☒ small city ☒ village
5	Goals of the activity	The project "TRANSITION TO CIRCULAR ECONOMY THROUGH COMPOSTING IN HOUSEHOLDS AND IN PILOT SCHOOLS IN THE MUNICIPALITY OF ETROPOLE" is aimed at preventing the formation of municipal solid waste (waste) and the amount of "municipal waste" in the municipal waste. The project will cover the entire municipality of Etropole - the town of Etropole, the villages of Brusen, Boykovets, Lopyan, Luga, Ribaritsa, Yamna and Malki Iskar. For the implementation of the project the good practice for composting in the community and households, introduced by the municipality of Chambery, France, was chosen for implementation.

6	Description	A detailed description of the practice (500 words), describing:
		The activity was relevant to the topic of
		    ☒ circular economy (CE), ☐ education for sustainable development (ESD), or ☐ both CE and ESD
		  a. Main Steps (what was the preparation, what activities the participants went through, what were the results)
		    Survey of attitudes in the community and households to prevent waste generation. Organizing and conducting 2 focus groups with 3 representatives of households, parents, schools, retirees, main generators of solid waste; developing questionnaires and conducting a survey;
		    Equipping two green classrooms in order to create conditions and methodology for the introduction of a demonstration educational program in the two pilot schools in the municipality of Etropole: Primary School "Hristo Botev" and Secondary School "Hristo Yassenov". The aim is to increase

		the knowledge of students from 1st to 8th grade on composting and prevention, separate collection and prolonging the life of separately collected waste; ● Equipping schoolyards with Demonstration composting systems and involving students, teachers and parents in various activities related to waste prevention; ● Provision of composting containers to 200 households in the villages of Etropole municipality, in order to introduce and implement a home composting program; ● Preparation of manuals for composting in households; ● Conducting trainings for the persons who will use the respective material assets (composting containers in the community and households) for the purposes of implementing the good practice; ● Monitoring of implementation in households and the community (schools) b. Any specific theories, which the practice was based on
7	Implementation choices	Write a brief presentation of the best practice (max: 500 words) by referencing to: a. Target groups - Schools, municipalities and households.). b. Other participants in the activity, besides the promoter and the target groups c. Duration 24 months d. Number of sessions/activities ● Survey of attitudes in the community and households; ● Equipping two green classrooms; ● Equipping schoolyards with Demonstration composting systems; ● Provision of composting containers to 200 households; ● Preparation of manuals for composting in households; ● Conducting trainings; ● Monitoring. e. Teaching methodology, if applicable NA f. Type of assessment and tools used to identify the benefits NA
8	Green skills targeted by the good practice	The green skills (see detailed explanations for each green skill after the end of this form), which the practice contributed to A) theoretically B) practically ☐ Creative problem-solving A ☐ B ☐ ☐ Forward-thinking A ☒ B ☒ ☐ Monitoring skills A ☐ B ☐ ☐ Analytical skills A ☐ B ☐ ☐ Management skills A ☐ B ☐ ☐ Impact quantification skills A ☐ B ☐ ☐ Life-cycle management skills A ☐ B ☐ ☐ Lean production skills A ☐ B ☐ ☐ Maintenance and repair skills A ☐ B ☐ ☐ Science skills A ☐ B ☐ ☐ Waste management skills A ☒ B ☐

		☐ Environmental auditing skills	A ☐ B ☐
		☐ Ecosystem management skills	A ☐ B ☐
		☐ Pollution prevention skills	A ☐ B ☐
		☐ Eco-Design skills	A ☐ B ☐
		☐ Other, please, specify:	_____
9	Materials/equipment	The materials/equipment required for carrying out the activities of the good practice Prepared materials: The teacher's manual - practical and theoretical manual "Composting and zero waste". Educational materials for students. Production of audio-visual materials for composting for green classrooms for children 2 educational videos x 10 min.	
10	Who runs the activity	☐a person ☒an organization/institution ☐a VET school ☐a company/enterprise ☐an NGO ☐other (please, describe)	
11	Benefits and results	a. The benefits of this best practice for the target groups Creation and introduction of a composting system in the yards of two pilot schools in the town of Etropole. In order to improve the quality of the service and reduce the share of waste generated by students, as well as from lawns to schoolyards and green areas around them. Providing a system of several composters with a capacity of 400 and 1200 liters, depending on the number of students in each school. Creating videos "The magic of composting" - Children participating in the program create non-professional videos filled with content in the form of stories, photos, demonstrations, the idea is through their eyes to present the learned and applied skills, what is their impact on school, at home and especially in the environment. The resulting compost will be used to fertilize green areas in schoolyards. Preparation of educational materials and contents for the Demonstration Program for a class on "Composting and zero waste". Development of a methodology and TEACHER'S MANUAL for conducting classes on "Composting and zero waste" for teachers / parents-volunteers. b. Community/social/economic impact Teachers, students, citizens, local organizations. These will include participation in information events, dissemination of information materials and regular provision of information in order to engage the target groups, the community and report on the progress of the project. The information will be prepared and published on the information site of the municipality of Etropole and in an open and maintained profile of the initiative on social networks. This activity will provide information on all stakeholders (teachers, principals and parent boards, schools, households, retirement clubs, etc.), as well as the general public, information on the	

		objectives and results of the project. During the implementation of the project, information will be disseminated about the EU's financial contribution to the implementation of the project, as well as the role of OPE.
12	Relevance for the TREE Project	a. Related to one or more of the priority sectors (NO) b. Involves micro- and project-based learning practices (Individual choice of teachers) Teachers will develop teaching materials. They will engage students to participate in events through project-based learning. The following 4 campaigns are planned: - Dissemination of the created videos "The Magic of Composting" in front of an audience during "Earth Day". Campaign for a place in the school yard, which will be transformed into a "Wonderful Garden", a competition on the logo of the "Young Composer".
13	Website E-mail Other contact info References	Any references listed, should be cited by using the APA referencing style *http://2020.eufunds.bg/bg/8010510/0/Project/Activities?contractId=1ZVaxYoWSJI%3D&isHistoric=False*

Table 5. Example of Good Practices selected by Kėdainių profesinio rengimo centras, Lithuania.

1	Title	Eco-friendly Europe
2	Country	Turkey, Poland, Italy, Denmark, Lithuania, Spain
3	How is/was it promoted?	- within the framework of Erasmus + Learning Mobility of Individuals
4	Context of implementation	☒ large city ☐ small city ☐ village
5	Goals of the activity	As the main aim of the project was to divert European youth's behaviour towards Eco-Friendly lifestyle, below listed objectives were set: ● encourage a proactive approach towards green initiatives; ● promote an eco-sustainable behaviour; ● to identify the most common negative outcomes of people's habits concerning environment, as well as find ways to tackle that; ● increase awareness about the existing environmental problems in Europe.
6	Description	a. The activity was relevant to the topic of ☐ circular economy (CE), X education for sustainable development (ESD), or ☐ both CE and ESD b. Main Steps. To successfully reach set aims and objectives, various non-formal education activities were held during participants' mobilities. These include, but are not limited to: ● interactive sessions with environmental activists; ● interactive workshops and theatrical plays on the topic; ● making videos, photos and social media campaigns on eco-friendly lifestyle;

		● presentations on best practices for saving environment from participants' countries; ● group discussions in a non-formal environment; ● visiting 'Kūrybos kampas 360' – the concept of trash design; ● capturing environmental problems in Kaunas through photography. c. Any specific theories, which the practice was based on
7	Implementation choices	a. Target groups: Young adults b. Other participants in the activity, besides the promoter and the target groups: representatives from other NGOs c. Duration: 08-01-2018 - 07-07-2018 d. Number of sessions/activities: different activities connected with project topic e. Teaching methodology, if applicable: not described f. Type of assessment and tools used to identify the benefits: not described

8	Green skills targeted by the good practice	The green skills (see detailed explanations for each green skill after the end of this form), which the practice contributed to
		  A. theoretically
		  B. practically
		
		☐ Creative problem-solving A ☒ B ☒
		☐ Forward-thinking A ☐ B ☒
		☐ Monitoring skills A ☒ B ☒
		☐ Analytical skills A ☒ B ☒
		☐ Management skills A ☐ B ☒
		☐ Impact quantification skills A ☒ B ☐
		☐ Life-cycle management skills A ☒ B ☒
		☐ Lean production skills A ☒ B ☐
		☐ Maintenance and repair skills A ☒ B ☐
		☐ Science skills A ☒ B ☐
		☐ Waste management skills A ☒ B ☐
		☐ Environmental auditing skills A ☒ B ☒
		☐ Ecosystem management skills A ☒ B ☐
		☐ Pollution prevention skills A ☒ B ☐
		☐ Eco-Design skills A ☒ B ☐
		☐ Other, please, specify: _____

9	Materials/equipment	Computer, internet connection, project website.
10	Who runs the activity	☐ a person ☒ an organization/institution ☐ a VET school ☐ a company/enterprise ☒ an NGO ☐ other (please, describe)
11	Benefits and results	a. The benefits of this best practice for the target groups: These activities not only helped in achieving the goals, but also contributed to the professional and personal growth of the participants. Participants learned how to responsibly act

		towards environmental safeguard; increased their social skills, as well as multilingualism and stimulated their cultural exchange; learned how to get involved in discussions and decision-making in an international environment (in various topics, which include eco-friendly attitude and actions). Furthermore, through carried out public actions participants became more proactive and learned how to put ideas into actions. All of the above mentioned, together with newly gained and extended social networks with like-minded youth from different EU countries and field experts prepared them for private and public environmental challenges. b. Community/social/economic impact: Organisations improved their international capacities in tackling ecology related issues, while youth enhanced their skills and competencies required to promote Eco-friendly lifestyle. Furthermore, public awareness on environmental issues grew in participating countries, as well as possible solutions, which include empowerment of youth to take action in boosting environmental change in Europe.
12	Relevance for the TREE Project	a. Related to one or more of the priority sectors Project is related to the green issues as a whole as it deals with topics, which include eco-friendly attitude and actions). Completed activities and dissemination results help to develop an eco-friendly lifestyle. b. Involves micro- and project-based learning practices: Not explained.
13	Website E-mail Other contact info References	*https://activeyouth.lt/eco-friendly-europe/*

Table 6. Example of Good Practices selected by S.A.F.E. Projects, the Netherlands.

1	Title	Name of the best practice selected Tough WASTE PRODUCTS #UPCYCLEBICYCLE Global Goals in Alkmaar
2	Country	The Netherlands
3	How is/was it promoted?	- within the framework of a European project - within the framework of a national project - as a part of a VET school curriculum - as a part of a research programme ☒ as initiative of person/SDG community
4	Context of implementation	The context where the best practice was developed ☐ large city ☒ small city ☐village
5	Goals of the activity	To give valuable waste a second life by having it collected
6	Description	A detailed description of the practice (500 words), describing: a. The activity was relevant to the topic of ☐ circular economy (CE), ☐ education for sustainable development (ESD), or X both CE and ESD

		b. Main Steps (what was the preparation, what activities the participants went through, what were the results) We have shown that we can give valuable waste a second life by having it collected by people with a distance to the labor market with an electric bicycle. 2100 kilos in 3 months! Alkmaar volunteers decided to collect green waste from horeca and bring it to agro farmers. The catering industry is thanked with sunflowers from the picking garden that grew on the coffee grounds. Tough waste products are a great initiative of the circular economy - where we no longer throw things away but reuse them to make it small and compact and therefore super successful.
7	Implementation choices	Write a brief presentation of the best practice (max: 500 words) by referencing to: a. Target groups HORECA sector and agro farmers b. Other participants in the activity, besides the promoter and the target groups (did it take place in cooperation with a company, other VET providers or an NGO) Cooperation between community, HORECA, agrofarms c. Duration 3 months d. Number of sessions/activities Collected waste when volunteers were able to visit involved horeca e. Teaching methodology, if applicable Non-formal learning f. Type of assessment and tools used to identify the benefits Common reached goal, successful results, satisfaction from all involved stakeholders. If the activity described took place during covid-19 pandemic, mention if and to what extent it has been carried out in presence and/or online. If the activity started before covid-19 and continued during, how was it adapted?
8	Green skills targeted by the good practice	The green skills (see detailed explanations for each green skill after the end of this form), which the practice contributed to A) theoretically B) practically

		☐ Creative problem-solving A ☐ B ☒ ☐ Forward-thinking A ☐ B ☐ ☐ Monitoring skills A ☐ B ☐ ☐ Analytical skills A ☐ B ☐ ☐ Management skills A ☐ B ☒ ☐ Impact quantification skills A ☐ B ☐ ☐ Life-cycle management skills A ☐ B ☐ ☐ Lean production skills A ☐ B ☐ ☐ Maintenance and repair skills A ☐ B ☐ ☐ Science skills A ☐ B ☐ ☐ Waste management skills A ☐ B ☒ ☐ Environmental auditing skills A ☐ B ☒ ☐ Ecosystem management skills A ☐ B ☒ ☐ Pollution prevention skills A ☐ B ☒ ☐ Eco-Design skills A ☐ B ☐ ☐ Other, please, specify: _____ Cooperation skills Volunteering skills
9	Materials/equipment	The materials/equipment required for carrying out the activities of the good practice Bicycles, containers
10	Who runs the activity	☐ a person ☐ an organization/institution ☐ a VET school ☐ a company/enterprise ☒ an NGO ☐ other (please, describe)
11	Benefits and results	a. The benefits of this best practice for the target groups Alkmaar residents have come up with the Innovation Council and dozens of them are committed to making Alkmaar a beautiful living environment. Where innovative ideas are given a place to achieve a sustainable, clean, fair and inclusive city. Weekly SDG consultation hour on Friday about everything you want to ask about and do with the SDGs. b. Community/social/economic impact Sustainable, clean, fair and inclusive city.
12	Relevance for the TREE Project	a. Related to one or more of the priority sectors (plastic, agrifood, wood) Initiative connected with TREE project because it shows practical examples, how horeca can work together with community and agrifood using circular economy principles. b. Involves micro- and project-based learning practices (list and mention how)

		Project based learning was launched as a good practice implementation in the region. Through involving different stakeholders (horeca entrepreneurs, community, agro farmers) the initiative reached results and was a good example of awareness campaign.
13	Website E-mail Other contact info References	*https://libguides.murdoch.edu.au/APA#:~:text=The%20APA%20referencing%20style%20is,and%20the%20year%20of%20publication* *https://globalgoalsalkmaar.nl/987-2/*

Table 7. Example of Good Practices selected by VšĮ „eMundus", Lithuania.

1	Title	Sustainable Public Buildings Designed and Constructed in Wood
2	Country	Lithuania
3	How is/was it promoted?	- within the framework of a European project
4	Context of implementation	☒ large city ☐ small city ☐ village
5	Goals of the activity	The wider objective of this project is to develop a trans-disciplinary and transnational course/ elective element in the EU HEIs on the design, construction, and management of sustainable public wooden buildings in order to enhance the quality and relevance of students' knowledge and skills for future labour market needs.

6	Description	A detailed description of the practice (500 words), describing:
		   a. The activity was relevant to the topic of
		     ☐ circular economy (CE), X education for sustainable development (ESD), or ☐ both CE and ESD
		   b. Main Steps (what was the preparation, what activities the participants went through, what were the results)
		Project Reference: 2018-1-LT01-KA203-046963
		The project stems from the reflections that advanced companies in the construction sector are interested in using construction materials that have a lower environmental impact. In this context stakeholders increasingly see wood as the natural and sustainable option for large public buildings. Most HEIs with technical degrees in design, construction and materials for complex buildings have curricula implementing the studies of concrete and steel, being prefabricated, or manufactured on site. Normally education in construction from wood focuses on 1 to 2 storey buildings (i.e. family houses). There is an urgent need to educate students with innovative applied skills needed in the area of massive wooden structures and large public buildings' construction at the undergraduate degree level.
		Project was implemented by five higher education institutions from Lithuania, Denmark, United Kingdom, Finland and Latvia, Lithuanian State Enterprise Center of Registers and Study and Consulting Center.
		Outputs:
		   1. International Market Report on Wooden Public Buildings;
		   2. Database on Wooden Public Buildings;
		   3. Study on Best Practices in Wooden Public Buildings' Design and Construction;

		4. BSc/BA module/elective element "Design, Construction and Management of Wooden Public Buildings"; 5. E-learning course "Design, Construction and Management of Wooden Public Buildings"; 6. Handbook "Design, Construction and Management of Wooden Public Buildings"; c. Any specific theories, which the practice was based on: Solutions in design, construction, and management of sustainable wooden public buildings.
7	Implementation choices	a. Target groups: HE's students, teachers from HEIs and enterprises. b. Other participants in the activity, besides the promoter and the target groups: professional associations, building entrepreneurial associations and private companies. c. Start: 01-09-2018 - End: 31-12-2020 d. Number of sessions/activities e. Teaching methodology, if applicable : Students gained innovative knowledge on Pub-Wood issues, by using blended learning (combination of online digital media with traditional classroom methods), problem-based learning and learning by doing methods they improved their skills in critical thinking, problem solving, group work, negotiation, reaching consensus, taking responsibility for own learning and social participation. Much attention was given to digitalization of the study process – an e-learning course available at Moodle environment was developed. f. Type of assessment and tools used to identify the benefits
8	Green skills targeted by the good practice	A) theoretically B) practically ☐ Creative problem-solving A ☒ B ☐ ☐ Forward-thinking A ☐ B ☒ ☐ Monitoring skills A ☐ B ☒ ☐ Analytical skills A ☒ B ☐ ☐ Management skills A ☒ B ☐ ☐ Impact quantification skills A ☒ B ☐ ☐ Life-cycle management skills A ☒ B ☐ ☐ Lean production skills A ☒ B ☐ ☐ Maintenance and repair skills A ☒ B ☐ ☐ Science skills A ☒ B ☐ ☐ Waste management skills A ☒ B ☐ ☐ Environmental auditing skills A ☐ B ☒ ☐ Ecosystem management skills A ☐ B ☒ ☐ Pollution prevention skills A ☒ B ☐ ☐ Eco-Design skills A ☒ B ☐ ☐ Other, please, specify: _____
9	Materials/equipment	Computer, internet connection, European and national statistics on public wooden buildings, education, research and business data,

		learning modules, best practice examples of wooden construction projects.
10	Who runs the activity	☐ a person ☒ an organization/institution ☐ a VET school ☐ a company/enterprise ☐ an NGO ☐other (please, describe)

11	Benefits and results	a. The participants (students and teachers) increased their knowledge, motivation and obtained a wider view of today's rapidly growing environmental problems faced in our planet, e.g. green-house gas emissions, carbon and ecological footprint, climate change as a background to explain why the use of wood in public buildings is important for the future world-wide construction industry.
		b. Teaching staff of universities enhanced their competences on innovative module development and teaching strategies, by taking part in intensive training, workshops, and development of intellectual outputs.
		c. HEIs have the opportunity to educate new professionals, who will be able to apply their knowledge and contribute to the design, construction and management of sustainable public wooden buildings. Stakeholders, e.g. professional associations, building entrepreneurial associations and private companies were involved in the process of definition of the new professional profile, development of the new module and teaching materials. By sharing innovative knowledge to all stakeholders' groups, the project promoted an idea of sustainable construction in wood to wider society.
		d. results:
		   ● database on wooden public buildings
		   ● E-learning course on "design, construction and management of wooden public buildings"
		   ● handbook on "design, construction and management of wooden public buildings"
		   ● learning course for students in UK
		   ● study of best practices on design, construction of wooden public buildings
		   ● international Market report on wooden public buildings
		   ● comparison of educational system- selection of structural system for wooden public buildings: multiple criteria approach
		   ● BSc/BA module/elective element "Design, Construction and Management of Wooden Public Buildings" is available at e-learning course.

12	Relevance for the TREE Project	The project "Sustainable Public Buildings Designed and Constructed in Wood" is relevant for the TREE project because it addresses some horizontal priorities stated in European reports, in a more specific way the theme of wood, focused on wooden public buildings.

		The TREE project can benefit from the research and the findings of the project, as well as from the analysis of the international market report and the database on wooden public buildings.
13	Website E-mail Other contact info References	*https://ec.europa.eu/programmes/erasmus-plus/projects/eplus-project-details/#project/2018-1-LT01-KA203-046963*

Table 8. Example of Good Practices selected by Zinev Art Technologies, Bulgaria.

1	Title	Girls Go Circular
2	Country	Bulgaria (+ Greece, Romania, Hungary, Poland, Serbia, Italy, Portugal)
3	How is/was it promoted?	- within the framework of a European project
4	Context of implementation	The context where the best practice was developed ☒ large city ☐small city ☐village
5	Goals of the activity	This initiative aims to equip 50 000 schoolgirls aged 14-18 across Europe with digital and entrepreneurial skills by 2027 through an online learning programme about the circular economy.
6	Description	A detailed description of the practice (500 words), describing: a. The activity was relevant to the topic of ☐ circular economy (CE), ☐ education for sustainable development (ESD), or X both CE and ESD b. Main Steps (what was the preparation, what activities the participants went through, what were the results) The online learning platform developed in the framework of the project – the "Circular Learning Space" – offers students the option of choosing between different learning modules on topics like e-waste, climate change, food, or robotics. These modules are based on a learning-by-doing approach, transferring knowledge and skills through an interactive, challenge-based structure. The online learning helps the target group to: - Acquire knowledge on the circular economy - Gain insights into the steps taken by businesses towards the circular economy - Improve their digital and entrepreneurial skills - Come up with their own solution to societal and environmental challenges The Circular Learning Space is at the core of the project. Through the platform, students work individually and in groups during online and in-person sessions. The platform includes several modules, which explore the circular economy from different angles. While consolidating their knowledge on the green transition, students use digital tools to acquire practical skills. After successfully completing a learning module, students receive a certificate that attests the skills acquired.

		The project targets primarily girls but it is open to any learner.
		c. Any specific theories, which the practice was based on Entrepreneurship theory. Circular economy.
7	Implementation choices	a. Target groups – female students aged 14-18 b. Other participants in the activity, besides the promoter and the target groups (there are also companies involved in the project) c. Duration – until 2027 (7 years) d. Number of sessions/activities – individual pace, depending on the trainees using the learning materials. e. Teaching methodology, if applicable – online training improving digital skills, entrepreneurial skills and circular economy skills. f. Type of assessment and tools used to identify the benefits - self-check tests. This is an online activity.

8	Green skills targeted by the good practice	The green skills (see detailed explanations for each green skill after the end of this form), which the practice contributed to
		      A) theoretically
		      B) practically
		
		☐ Creative problem-solving A ☒ B ☒
		☐ Forward-thinking A ☒ B ☒
		☐ Monitoring skills A ☒ B ☒
		☐ Analytical skills A ☒ B ☒
		☐ Management skills A ☒ B ☒
		☐ Impact quantification skills A ☒ B ☒
		☐ Life-cycle management skills A ☒ B ☒
		☐ Lean production skills A ☒ B ☒
		☐ Maintenance and repair skills A ☐ B ☐
		☐ Science skills A ☒ B ☒
		☐ Waste management skills A ☒ B ☒
		☐ Environmental auditing skills A ☒ B ☒
		☐ Ecosystem management skills A ☒ B ☒
		☐ Pollution prevention skills A ☒ B ☒
		☐ Eco-Design skills A ☒ B ☒
		☐ Other, please, specify: _____

9	Materials/equipment	The materials/equipment required for carrying out the activities of the good practice Laptop or computer with access to the internet. Email account for the sake of registering and receiving access to the training materials.
10	Who runs the activity	☐ a person ☒ an organization/institution ☐ a VET school ☒ a company/enterprise ☒ an NGO ☐other (please, describe)

11	Benefits and results	a.	The benefits of this best practice for the target groups Improved digital and entrepreneurial skills through an online learning programme about the circular economy.
		b.	Community/social/economic impact: better prepared and trained green female entrepreneurs, changing their local environments and attitudes – this would have excellent positive long term effects on the direction of business and industry, the manner in which business is conducted and sustainability of good practices. The social and community impacts (the positive ones) might be more substantial than the economic impacts.
12	Relevance for the TREE Project	a.	Related to one or more of the priority sectors (plastic, agrifood, wood) There is a module dedicated to the Circular Economy of Food in Cities (so agrifood) and another one on Rethinking Plastics (so plastic sector).
		b.	Involves micro- and project-based learning practices (list and mention how) Not explained.
13	Website E-mail Other contact info References		The Ellen MacArthur Foundation https://eit-girlsgocircular.eu/about/

4. CONCLUSIONS

The widespread adoption of more eco-friendly approaches to economic production and consumption is changing the nature of work, and thus the skills required of many workers. While the greening of economies presents challenges, it also offers considerable potential for job creation. The development of skills for green jobs is crucial to ensuring an efficient transition to a green economy by matching supply and demand for skills. It is also vital in helping workers adjust to a rapidly changing workplace.

The greening of economies is expected to bring about long-term benefits in the form of reduced environmental damage but, also, significant opportunities and challenges. A growing concern is that the diffusion of environmentally friendly technologies and organizational practices may trigger labour market disruptions such as faster obsolescence of worker know-how and a rapid acceleration of the demand for existing and new competencies that, if in short supply, would lead to skill gaps (OECD/Cedefop 2014). Millions of new jobs and careers will be created in the green economy. But creating new jobs is only part of the equation. Developing an appropriately skilled workforce is critical.

Vocational education and training (VET) is the strategic body for ensuring a world of work that contributes to social connection and promotes environmentally friendly sustainable development. Vocational Education and Training and skills development initiatives play a main role not only in developing human and social capital, but also in promotion of the necessary skills and knowledge needed for more sustainable societies and greener economies.

5. SUMMARY

Transitioning from a fossil fuel-based economy to one based on the use of biomass is increasingly perceived as a needed feat among scholars, analysts, and policy makers. Defining effective ways to align sustainable supply chain practices to the CE paradigm represents a cutting-edge topic at the intersection of scientific research and public policy (Genovese et al. 2017).

International interest in sustainable and inclusive growth has gained impetus because of the recognition that the "brown" economy model does not address global issues such as growing inequality and social marginalization, environmental degradation, and resource depletion. Evidence has shown that the green economy is a potential source of employment, can halt further productivity loss, and can address climate change and environmental degradation. The process of greening the economy is likely to have important effects on labour markets everywhere.

As the pace and diversity of green technology dissemination will increase in the coming decades, new markets will emerge, raising the demand for green jobs and related skills and offering opportunities for increased gender equality. Occupations related to the green economy cut across diverse sectors (from manufacturing, to agriculture, management, services, information technology (IT), and advanced materials research), requiring different skills that may or may not be currently available.

Broadly, three kinds of skill set for green jobs can be identified. The first is general sustainability literacy, predominantly in the form of soft skills, awareness, and action competence. The second set includes occupation-specific science, technology, engineering, and mathematics skills, while the third set encompasses leadership and management skills aimed at green transition. Many of these skills exist and are transferable, but need to be further strengthened and mainstreamed, or complemented with additional green concepts and practices.

Adoption of the Circular Economy (CE) can result in superior environmental performance through energy and resource efficiency, and waste reduction. Moreover, the 'design' function contributes the most towards the adoption of CE in VET, whereas the 'recover' function contributes the least, considering the current state-of-practices.

The application of green projects connected with the circular economy (CE) and sustainable development will allow future generations to live in cleaner and more sustainable environments as young people of today raise their awareness of the concept, see and take part in all green initiatives, and live sustainably each day.

Keywords: *green economy, circular economy, VET schools, sustainable development*

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5

THE EFFECTS OF THE CIRCULAR ECONOMY (CE): NEW JOB OPPORTUNITIES FOR "GREEN" SKILLED WORKERS

CHAPTER 5

THE EFFECTS OF THE CIRCULAR ECONOMY (CE): NEW JOB OPPORTUNITIES FOR "GREEN" SKILLED WORKERS

Authors:

Carlotta Maria Crippa, Všį "eMundus" (Lithuania)

Živilė Navikienė, S.A.F.E.Projects (The Netherlands)

1. GREEN ECONOMY AND CIRCULAR ECONOMY CONCEPTS

Hundred years ago nobody was talking about sustainability because the adverse effects of consumerism and mass production had not yet manifested themselves with the irrevocable clarity of today. Now we must rethink our economic models, introducing greater attention to the environment and the citizens. Responsible consumption habits, sustainability values and understanding the main principles of sustainability will allow faster transfer of circularity in all life fields.

The European Commission defines sustainable development as one of the priorities in all sectors and fields. The Europe 2020 Strategy focus is on smart, inclusive and sustainable growth. Sustainable development implementation is based on different approaches, but the importance of the circular economy as a process of re-using created products chain gives opportunity to minimize waste. Consumerism, needs, and marketing campaigns create economic value, however, creates mountains of garbage, and waste, as well. We are forced to think, re-think and re-start our consuming habits, and product creation, to think about waste management. Re-thinking is the first step to start changes, however, real actions in daily life, education, and industry creates a circular economy environment where each of us lives more sustainably. The European Green Deal concept created by the European Commission shows the importance of sustainability and underlines new approaches to production, services, design and stimulates use of circular economy principles.

"*A new Circular Economy Action Plan For a cleaner and more competitive Europe*" (European Commission, 2020) describes "*circularity is an essential part of a wider transformation of industry towards climate neutrality and long-term competitiveness*" (European Commission, 2020 p.6) European Commission emphasizes a greener, smarter, sustainable Europe that is using resources efficiently for the environment and people. Circularity is a concept based on re-using, re-cycling, re-sharing, repairing everything as much as possible. Circular economy is based on the same main principles (reusing, re-cycling, re-sharing, repairing) and creating more eco-friendly, environmentally neutral solutions for production and process. The wave of quick consumption fashion is becoming more sustainable too, but still, products should become more eco-friendly. The European Commission Green Growth and circular economy puts more effort for "*resource efficiency, encourages eco-innovation, provides tools that can help you recognize green products and supports eco-friendly, innovative businesses*" (The European Commission Green Growth and circular economy)

The concept of green economy is defined as the system that improves economic activities focused on sustainability implementation. The green economy consists of political support, tools and instruments to create a greener and smarter economy, an education system to prepare competencies needed for each economic sector, and a social process based on circular economy principles. A greener economy means eco-friendly solutions in all industrial sectors and dimensions – from workers to consumers' behaviors from production to services, based on circular economy principles, Sustainable Development Goals (SDGs) and climate neutral actions.

In figure 1, is shown the green economy connection with the circular economy principles. Green economy includes circular economy principles, such as creating green jobs, developing green skills and creating green products and services.

Figure 1. Green economy connection with circular economy principles (Navikienė Ž.,2022)

D'Amato et al. (2017) analyze the "Circular Economy" (CE), "Green Economy" (GE) and "Bio-Economy" (BE) to explain similarities and differences among these concepts. The GE approach promotes mainly "*a green growth through nature-based solutions and investments dedicated to promoting restoration, conservation and sustainable management of natural capital through social inclusivity*" (D'Amato et al., 2017). In fact, GE considers social inclusion as fundamental for implementing real sustainable growth. Moreover, it is the only narrative to specifically address the sustainable development aspects of justice and public participation. GE also refers to various ecological processes, and thus embodies a greater variety of disciplinary perspectives. In fact, as it was stated by D'Amato et al. (2017, p.725) "*while CE and BE are resource-focused (i.e. provisioning ecosystem services), GE in principle acknowledges the underpinning role of biodiversity and all ecosystem services, including regulating and cultural services*".

As it was mentioned above a green economy defines common sustainable development and a circular economy mostly focused on industrialization and urbanization. Bioeconomy's main focus is on biomass and renewables in energy production.

According to the D'Amato et al. (2017) approach, the green economy can be considered as an "umbrella concept" which includes a variety of topics and issues.

It can be said that "*the green economy is thus considered the key solution for achieving growth and creating new jobs by increasing energy efficiency, (...) reducing waste and its recycling, as well as protecting the planet's biodiversity*" (Boțoteanu, 2022 p.40).

2. THE EFFECT OF CIRCULAR ECONOMY ON OCCUPATION

It's natural that the development of new products and services creates new requirements (i.e. skills and knowledge) for occupations, and because of that Vocational Education and Training (VET) institutions are asked to teach and transmit new competencies to the students. Green economy and circular economy principles create demand for new skills in the working place, the new way of thinking and approaches for consuming and producing goods and services. Cedefop (2021) forecasts the shift towards a green and circular economy will create more than 2,5 million jobs. Transition to a green economy and green jobs should be done through consistently up- and reskilling of citizens and workers. In fact, the up- or re-skilling process creates demand for everybody to work based on Sustainable Development Goals (SDGs), circular economy principles promotion, and the re-orientation of economic activities to a greener economy.

Cedefop (2021) provides insights about how a green and circular economy will influence vocational education and training (VET) education and skills. Importance to forecast occupational developments helps to assure that VET will be prepared to fulfill up-reskilling demand. According to Cefefop (2021, p. 23) "*employment will initially be boosted as a result of implementing green projects (including renovating buildings, constructing new recycling plants, and shifting factory technology to clean energy-based)*".

The European Green Deal (EGD) foresees changes in the following economic sectors: zero-carbon energy power generation and use, buildings, waste management and other parts of the manufacturing sector (such as recycling, plastics, and electronics). Based on these aspects Cedefop (2021, p. 23) expects "*that employment changes linked to the EGD will be most pronounced in the sectors active in such activities. In the EGD scenario, the sectors that are expected to see the largest employment gains are utilities (through increased recycling activities), electricity supply (through increased demand for renewable energy), manufacturing of appliances/electrical equipment (e.g. for the renewable electricity generation sector, or more energy efficient appliances), construction, and the sectors that link to these via supply chains*".

The forecast scenario presented by Cedefop (2021, p.42) highlights involvement of different stakeholders' involvement and cooperation – "*governments, employers, regional and local authorities, VET and other types of providers, research institutions and other actors are jointly responsible for managing skills ecosystems and need to share design and policy implementation to make the green transition smooth and inclusive and to keep it on track*".

Forecasting the future skills depends on market needs, political strategies, and funding. Social dialogue between different stakeholders assures new trends in occupations. There are a lot of initiatives that create possibilities for different stakeholders to cooperate. The Green Policy Platform focused on the Green Growth Knowledge Partnership (GGKP) is a worldwide community of policy, business, and organizations committed to share knowledge on the transition to the green

economy. This platform consists of three knowledge platforms – the Green Policy Platform, Green Industry Platform, and Green Finance Platform. Users of this platform can find the newest research, can learn how to transfer to a greener economy, can browse knowledge and learn from 193 countries, 6 regions, and 49 sectors and themes. A joint initiative by the European Commission and the European Economic and Social Committee, the European Circular Economy Stakeholder Platform brings together stakeholders active in the broad field of the circular economy in Europe. These platforms and joint forces to cooperate with different countries and stakeholders helps to accomplish the transition to greener competencies description and development.

The literature review done by Boțoteanu *et al.* (2022, p. 40) shows "*significant gaps in knowledge in the field, due to the use of various approaches in defining green jobs, with different spheres of coverage, and due to the wide variety of relevant policies used*". Sulich *et al.* (2022) summaries green jobs definitions and in Figure 2 explains green jobs creation model for circular economy.
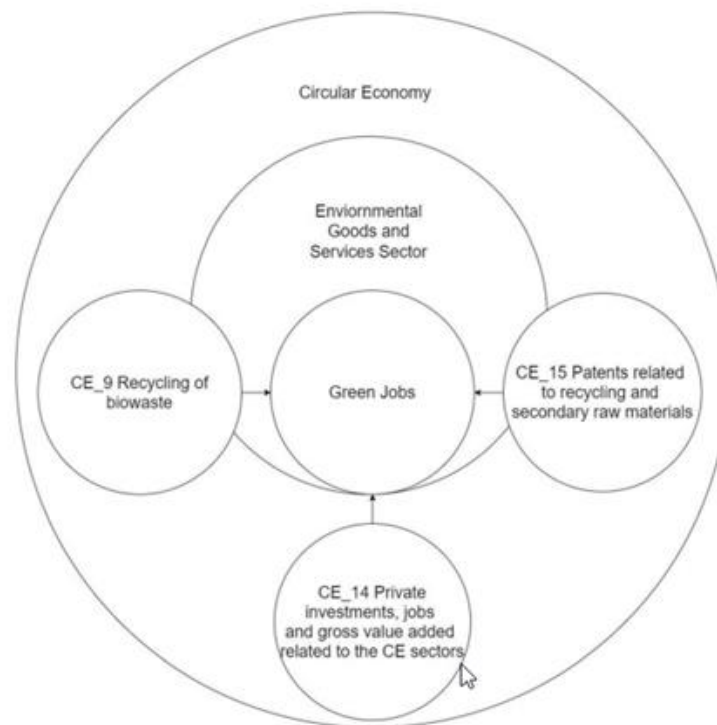
Figure 2. Green jobs creation model for circular economy (Sulich, A., Sołoducho-Pelc, L., 2022 p.14242)

Alex Bowen et. Al (2018,p. 264) defines 3 subcategories of green jobs – green increased demand, green enhanced skills, green new and emerging. Green Increased Demand are existing jobs that are expected to be in high demand due to greening, but do not require significant changes in tasks, skills, or knowledge. These jobs are considered as indirectly green because they support green economic activity, but do not involve any green tasks. Green Enhanced Skills are existing jobs that require significant changes in tasks, skills, and knowledge as a result of greening. Green New and Emerging are unique jobs (as defined by worker requirements) created to meet the new needs of the green economy.

Occupational demand prognosis emphasizes greener skills will be needed in each institution or occupation however, not all professions are directly connected with green skills or sectors that are especially focusing on green economy development. In Europe we observe changes in production business towards sustainability. Business organizations are starting not only to discuss and prepare SDG strategies but already have started to implement sustainable ideas into production and services because consumers are becoming more aware and choosing greener businesses.

3. THE IMPORTANCE OF UP-SKILLING AND RESKILLING

By 2030, the transition to a green economy is expected to lead to the emergence of 60 million new jobs (Attard & Grech, n.d.). In the Future of Jobs Report (World Economic Forum, 2020) it has been stated that the so-called "skills gap" will remain high in the next 5 years, because the skills sought by businesses and needed in the workplace will be different from those most workers currently have. This has been confirmed by the "Davos Lab Survey", where 2.3 million people answered and half of the young people declared to feel inadequately skilled (World Economic Forum, 2021, pag. 4). Changes in the competences and skills asked for future and current workers are expected in many different economic sectors, such as agriculture, farming, teaching (United Nation, 2021), healthcare and construction (Masterson, 2022). As the shift toward a "green" and more "circular" economy now seems to be considered a certainty by many, we need to figure out how to pass on the skills to accelerate this change. According to the United Nations, in fact, the skills mismatches can be considered as "*a major problem in moving to a green economy*" (United Nation, 2021, pag. 143) and that is why it is fundamental to integrate the so-called green skills into our education system. If what is taught in schools and how it is taught becomes more "green" and "circular" then so will our society, including the world of work. It is therefore clear that the demand for "green skills" by employers and the Education for Sustainable Development are two mutually dependent phenomena: the greater the demand for workers with skills related to the circular economy, the more urgent the inclusion of these skills in the education system, the more green and circular activities and jobs will be created and so on.

By beginning to integrate so-called "green skills" (see Chapter 4) into the education system, future generations will be able to meet the needs of the labor market, but what about the people who are already working? In the United States of America, for example, there has been a 237% increase in renewable and environmental jobs over the past 5 years (Masterson, 2022), while in parallel, some jobs that are diffused nowadays are expected to disappear or significantly decrease in the number of people employed due to several factors (digital transition, Covid-19 pandemic, green transition, etc.). In this context, the concepts of "upskilling" and "re-skilling" are becoming more and more popular.

On one hand, upskilling is commonly defined as "*the process of individuals learning new skills*" (Cohen, 2019), or, in other words, the process of acquiring new knowledge and skills or "updating" the ones an individual already has. Upskilling strategies are usually promoted by the employer, depending on the needs of the organization. According to the Academy to Innovate HR (n.d.), the most common are:

- Organize Learning and Development (L&D) programmes, which consist in four phases: "*an analysis of the training needs, a specification of the learning objectives, the design of training content and method and the monitoring and evaluation*" (Verlinden, n.d.);

- Job rotation, which consists of having employees take on different job roles in rotation, adopting the "learning by doing" methodology;
- Job enlargement or enrichment, which consist in adding extra dimensions or activities to existing jobs.
- Peer coaching, in order to let people expand their competences thanks to their colleagues.

On the other hand, re-skilling is defined as "*the process of learning new skills so that you can do a different job, or of training people to do a different job*" (Talentguard, n.d.). Given the above-mentioned trends in the job market and in the economy, it is expected that in the next years four out of ten workers will need to be re-skilled (World Economic Forum, 2020). A company can decide to propose the re-skilling to its own employees in case there's the need to re-collocate workers from one sector to another. In this case, after having identified the skills that a person should acquire in order to switch to a different job, the company can combine a variety of reskilling methods, such as on-the-job training or online, blended or peer learning (Boatman, n.d.). In fact, in a reskilling process it is often encouraged the job shadowing, which consists in following and observing an experienced employee perform his/her everyday activities.

In conclusion, it is expected that a lot of workers in various economic sectors will need to acquire new skills in order to catch up with the current trends that are recognizing more and more importance to green skills.

4. THREE KEY ECONOMIC SECTORS

In this paragraph we aim at describing three economic sectors and their potential role in the transition toward Circular Economy (CE) and sustainability: the plastic sector, the agri-food sector, and the wood sector. They were selected among the other economic sectors because of their relevance for the shift toward a more green, sustainable, and circular economy. In fact, plastics, construction, and buildings (where wood plays an important role) and food are listed as "Key Value Chains" that require an immediate action in the Circular Economy Action Plan (2020).

4.1 The plastic sector

Single use plastic has been considered one of the main enemies of the environment. Plastic bags, cotton bud sticks and straws are just some of the things that can be easily found in the sea, in parks and in beaches. According to the estimation made by Forbes (2018) there are around 270,000 tons of plastic waste in the world's seas and oceans. This is endangering plants, animals, and other living beings, including humans, as well as irreparably damaging the ecosystem.

That is why single countries around the world as well as the European Union have adopted regulations to limit the use of plastic. In fact, the EU Directive 2019/904 on Single Use Plastic aimed at reducing the use of this type of plastic in all the cases in which alternatives are available and affordable. For example, it is applied to straws, plastic cups, plates, stirrers but also to food and beverage containers made of expanded polystyrene. In other words, the EU is focusing on limiting their use by promoting raising-awareness campaigns and by introducing design and labeling requirements, as well as waste management obligations (European Union, 2019).

But if plastic has such a high impact on the environment, why do we continue to use it? Mainly because it is an easily moldable and transportable material and is low cost. In 2015, the plastic

sector employed 1.5 million people, with an economic value of 340 billion euro (European Commission, 2018). According to "A new Circular Economy Action Plan For a cleaner and more competitive Europe" (European Commission, 2020), the plastic use is expected to double in the next 20 years. The EU is addressing these issues by restricting microplastic use, creating a standardized labeling and design that are more eco-friendly and measuring unintentional microplastic production (European Commission, 2020).

In December 2015 the European Commission adopted the EU Action Plan for a Circular Economy, which "*identified plastics as a key priority and committed itself to prepare a strategy addressing the challenges posed by plastics throughout the value chain and taking into account their entire lifecycle*" (European Commission, 2018). In fact, just 30% of plastic waste is recycled and the percentage of use of end-of-life plastic is also very low (EC, 2018). It is essential to increase the recycling and reusing levels of plastic goods in order to reduce their impact on the environment, and this change should have an impact on the entire plastic life-cycle management process.

The European Union countries committed themselves to develop and adopt a new vision on plastic, in order to make it more responsive to the needs of the environment and to sustain the shift toward a more sustainable and circular economy. Some of the key elements of this EU strategy are:

- By 2030, all plastic packaging will be either reusable or recyclable in a cost-effective manner.
- Improvements of four times in the recycling capacity of plastic goods are expected within 2030, leading to the creation of 200,000 new jobs
- Strengthen collaboration between the chemical industry and the plastic recycling industry in order to create a virtuous cycle of recycling and reusing.
- Boost the demand of recycled plastic goods, by spreading information about its durability and usability and by adopting specific actions (EC, 2020).

From what has been said so far, it is clear that the plastic sector is expected to change in the next few years and hopefully to become more environmentally friendly. Some changes in the design of the plastic goods are already visible: for example, plastic bottles now have a cap that stays attached to the bottle so that it does not fall off and pollute the environment.

4.2 The agrifood sector

The agrifood sector has a huge impact on the environment and could be a major driver of a shift toward a circular economy if it adopts green practices aimed at preserving the ecosystem, decreasing waste, and using low-impact farming methods. Among the 17 Sustainable Development Goals, the number 2 is called "*end hunger, achieve food security and improved nutrition and promote sustainable agriculture*". The SDGs, together with the European Green Deal, testifies to the global importance of this sector as a potential driver of change toward a more sustainable and circular economy. In fact, making this sector more environmentally friendly may not only have a direct benefit for the environment, but also an "indirect" benefit: the production of biofuel and biomass, for example, would also make the energy sector "greener."

In 2018, agriculture contributed 1.1% to the entire EU GDP and employs around 4.72 million people, "*making it the largest manufacturing industry in the EU and the biggest manufacturing employer in half of the EU's 27 member states plus the United Kingdom*" (Opendei, n.d.). Given the relevance of this sector, policies dedicated to it have been adopted, among which the "Farm2Fork" strategy stands out in importance. This strategy represents the heart of the EU Green Deal and aims to "*make food systems fair, healthy and environmentally-friendly*" (European Commission, 2019). In fact, the "Farm2Fork" have the following general objectives:

- Encourage a sustainable production of food;
- Establish a sustainable food processing and distribution system;
- Raise awareness for sustainable food consumption;
- Prevent food waste and loss.

Within the EU Green Deal (2019) it was stated that for the period 2021 – 2027 at least 40% of the common agricultural policy's budget will be dedicated to climate actions. The Farm2Fork will contribute to reduce the impact that the food processing and the retail sectors have on the environment, with coordinated efforts that will lead to structural changes in transport, packaging, food waste and storage (EC, 2019). In other words, it aims at making the agricultural supply chain more sustainable. In fact, actions will be taken in all the stages of the supply chain, from the pre-production to the consumption phases, in order to make it more sustainable, effective, and affordable.

Several research have been conducted in order to identify new types of fertilizers that can ensure a high productivity without compromising the quality of the soil and of the environment, which are known as Environmentally Friendly Fertilizers (EFFs). While traditional fertilizers do not stay on the plant for long and leak into the surrounding environment polluting it, EFFs are designed to stay on the plant longer so that the plant has time to absorb them all without contaminating other elements (Chen et al., 2018). There are still a number of limitations of current EFFs that need to be overcome for their use to become widespread, such as their very high price and their constant but limited effectiveness, which may still not prove sufficient if a plant is threatened by pests (Szura, 2017).

As it was mentioned above, another urgent challenge to be overcome is food waste. In fact, according to the EU data, in Europe around 88 million tons of food waste is produced every year (FUSIONS, 2016) and that 20% of the food produced is either lost or wasted. The food loss refers to the fact that the food can be lost in the first steps of the supply chain, and more specifically from the harvest up to the retail level, while from the retail level up to the end of the supply chain we can talk about "food waste" (FAO, 2020). In this regard, it is not only companies that are being called upon to adopt more responsible and environmentally conscious behavior, but also ordinary people. Examples of good practices that we could all adopt are:

- store food wisely;
- buy only what we need;
- do grocery planning;
- read food labels carefully.

4.3 The wood sector

Wood has been one of the most widely used materials in the world since the past because of its versatility and affordability. Forests are an essential element in preserving plant, animal, and human life on earth as they absorb CO_2 and produce oxygen, improve soil quality and prevent its erosion. It is precisely because of this key role that careful and judicious forest management is needed to ensure their well-being and prevent them from disappearing.

In some parts of the world, however, what happens is the opposite: limited policies to protect forests, when not their total lack, leave space for uncontrolled logging. That is why it is so important to promote Sustainable Forest Management (SFM). The three main pillars at the heart of SFM defines its outcomes, that should be:
● socially just;
● ecologically sound;
● economically viable (PEFC, n.d.).

The SFM is defined by the FAO (n.d.) as a "*dynamic and evolving concept, which aims to maintain and enhance the economic, social and environmental values of all types of forests, for the benefit of present and future generations*". Despite the international attention devoted to this issue, its implementation is changes in space and time: not all countries apply its principles consistently, attracted, for example, by the short-term gains that land for cultivation offers and in the name of which they deforest uncontrollably (FAO, n.d.). Many certifications have been introduced so far in order to prove that wood constructions or furnitures are made following the principles of SFM, such as the ones made by the Forest Stewardship Council (FSC), the Programme for the Endorsement of Forest Certification (Ossenbach, 2020) and the EU "Timber Regulation" (Regulation 995/2010).

In the EU, the woodworking industries employ 1.093 million people and create a turnover of 122 billion euro (European Commission, n.d.). Moreover, it is worth mentioning that around 97% of raw wood material processed in the EU comes from sustainably managed forests (EC, n.d.). SFM and Circular Economy (CE) have a common approach with respect to reducing waste, reusing materials, and improving the eco-efficiency of wood processing.

According to the United Nations Economic Commission for Europe's data (2022), the construction and building sector is responsible for 39% of the global carbon emissions. Despite this, the role it could play in the transition to a CE would be very significant. Some more innovative construction techniques are enabling greater integration between the wood sector and other economic sectors, less waste, and better construction planning, such as the "off-site construction".

5. GREEN JOBS

Within this chapter, many factors have been mentioned that are commonly considered as the causes of current and future changes in the job market. The Covid-19 pandemic, for example, has had an impact on many aspects of our lives, including our work. Due to the restrictions introduced by governments, the digitization process has been accelerated as never before, bringing permanent changes that will last well beyond the end of the pandemic even in the workplace (Amankwah-Amoah *et al.*, 2021). Together with the digitization process and the Covid-

19 effects, also the green transition is having an impact on the job market and that is why the need of reskilling and up-skilling opportunities is so urgent and important.

International and national organizations, together with companies and other organizations, started to talk about "green jobs". The United Nation Environment Programme describes the green jobs as "*positions in agriculture, manufacturing, R&D, administrative, and service activities aimed at substantially preserving or restoring environmental quality*" (2008). Starting from this definition, the International Labor Organization (ILO) provides us with a more broad and updated definition in 2016, according to which "*green jobs are decent jobs that contribute to preserve or restore the environment, be they in traditional sectors such as manufacturing and construction, or in new, emerging green sectors such as renewable energy and energy efficiency*". In other words, green jobs are jobs that consider environmental preservation, protection, and restoration. The impact of these green jobs is, according to the ILO (2016), to ensure energy efficiency, limit carbon emissions, minimize waste and pollution, protect the ecosystems, and mitigate the effects of climate change. Fundamentals for the implementation of green jobs, but also for jobs that are not properly defined as "green", are the "green skills", that are addressed in the Chapter 4 "Green skills: definition in TREE project".

5.1 Examples of Green Job*s*

The list of "green jobs" reported below is not, and is not meant to be, exhaustive. To date, there are so many new roles related to environmental protection on various levels, and many more will emerge in the future. However, this paragraph is intended to show that green jobs do exist and that they affect many economic sectors that are also very different from each other. This can give us an idea of how much the ecological transition and the search for sustainable production and consumption methods is across the board in the modern economy.

5.1.1 Urban farmer

Urban farming is also known as "urban agriculture" or "urban gardening" and consists of "*(...) cultivating, processing, and distributing food in or around urban areas*" (Bailkey & Nasr, 2000). Urban farming is becoming more and more common due to the urbanization of people, the ecological transition, and the growing desire for people to adopt greener attitudes. In fact, according to the Food and Agriculture Organization of the United Nations' (FAO) data, 55 % of humans live in urban areas (FAO, 2019) and more than 800 million people are involved in urban and peri-urban agriculture in the world (Veolia, n.d.). Urban farming is particularly important because of its benefits, such as increasing the biodiversity in urban areas, nutrient cycling, and micro-climate control (Lock, 2021).

5.1.2 Sustainability Consultant

The sustainability consultant works within various organizations, both public and private, in order to promote sustainability by creating *ad hoc* strategies, policies and processes. This figure can work in a lot of different economic sectors, such as: "*urban regeneration, mining and drilling operations, infrastructure planning, industrial facilities operations, residential and commercial developments (but also) schools and education facilities*" (National Register of Environmental Professionals, 2021).

5.1.3 Environmental manager

Environmental managers make sure that policies and processes adopted within an organization are compliant with the environmental regulation and guidelines. According to Joboutlook (n.d.) the environmental manager usually identifies, monitors, solves and mitigates the environmental issues within an organization.

5.1.4 Eco designer

The Eco designer or green designer is concerned with recovering waste materials and reusing them, recycling, and designing new objects with the idea of extending their life cycle as much as possible. There are two methods that are currently adopted by Eco designers: the Life Cycle Analysis (LCA) and the Sustainable Product Design (SPD). The former has the aim of evaluating the duration of the lifecycle of an object; the latter has the aim of analyzing how to integrate environmentally friendly, social, and ethical elements during the phase of designing of an object (Anteritalia, 2018). Eco designers are active in many different fiends, including plastic, architecture, fashion and wood.

5.1.5 Environmental scientists

The demand for environmental scientists is expected to register a 8% growth between 20220 and 2029 (Lock, 2021). Environmental scientists and specialists "*use their knowledge of the natural sciences to protect the environment and human health*" (U.S. Bureau of Labor Statistics, 2022). Given the effects of climate change (rising temperatures, rising seas' level, etc.) that are expected to worsen in the future, it is not hard to see why environmental scientists will be increasingly in demand in the next few years.

6. CONCLUSIONS

In this chapter, starting with the definition of the concepts of circular economy and green economy, the effects that the ecological transition is having on the world of work were analyzed. The future prospects of this change, which include the disappearance of some types of work and the emergence of many new types related to the circular economy, have also been outlined.

In particular, the importance of upskilling and reskilling practices for workers who might be most affected by this change and the momentous scope of this change were discussed.

In addition, the current situation, and future prospects in the agrifood, wood, and plastics sectors when it comes to sustainability, environmental impact, and the circular economy were briefly outlined.

Finally, the green jobs have been defined and some of them described a bit more in detail.

In conclusion, climate change makes it increasingly urgent to speed up the ecological transition, which will have a cross-cutting impact on society and the world of work, as well as on production and consumption processes.

Key words: *circular economy, upskilling, reskilling, wood, plastic, agrifood*

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6

PROJECT-BASED LEARNING METHODOLOGY FOR TEACHING EDUCATION FOR SUSTAINABLE DEVELOPMENT

CHAPTER 6

PROJECT-BASED LEARNING METHODOLOGY FOR TEACHING EDUCATION FOR SUSTAINABLE DEVELOPMENT

Authors:

Desislava Tsokova, Profesionalna gymnazia "Asen Zlatarov" (Bulgaria)

Žilvinas Kapočius, Kėdainiai Vocational Educational Training Centre (Lithuania)

1. INTRODUCTION

Education is undoubtedly accepted as a major means in changing and transforming human behavior and practices towards a healthy and sustainable life. In the world of globalization and the new economy of today, challenging life with a highly competitive environment requires students to seek knowledge beyond the classroom and textbook as well as to have quality communication, problem solving and leadership skills. As an agent of change, education should incorporate the basic domain of knowledge, skills, as well as values across disciplines.

An educational theory that focuses on learning by doing is constructivism. It gives students the opportunity to gain knowledge and acquire skills through a project task based on real problems. Project-based learning (PBL) is a constructivist approach that aims to achieve deep learning by letting students work on issues and questions that are real and relevant to the topic they are studying. Project based learning is based on constructivist learning and discovery-based methods, both of which rely on the inquiry process and students' ability to come up with solutions based on their individual point of view and thinking. It is a method that places students at the center of the learning process, where they learn actively in order to improve their competences. (Jalinus N., Nabawi R. A., Mardin A. 2017)

Learning resources in project-based learning are multidimensional. The project task is based on real problems and gives the students an opportunity to improve their skills and to understand the topic that is being studied. Moreover, the method provides opportunities for students to understand how the knowledge and skills they gained apply to the real world. Project-based learning is widely considered to be collaborative, progressive, student-centered, and interactive, particularly for engineering education

The Education for Sustainable Development (ESD) is closely connected to the quality of life of all inhabitants of planet Earth, where economic, social, and environmental factors are interconnected. Therefore, it is about how education should be planned to serve the real-life situation without interfering with societal and environmental values of future generations (Yasin R. M., Rahman S. 2011).

2. PROJECT – BASED LEARNING

Project-based learning is a method which can develop pupils' thinking, prompts them to create original solutions, develop teamwork skills, find available literary resources, present, and evaluate

their findings. This method has a positive influence on the students, but in order for it to be successfully implemented in elementary and high schools, it is necessary to train and educate future teachers how to successfully apply it in their practice.

There are many definitions of project-based learning. Each involves a group of students finding a solution to a problem. The task is typically finished with the creation of a product – a thesis, report, design plan or model. Students' activity takes a considerable length of time and there is a variety of educational activities. The essence of project-based learning is that a question or problem organizes and drives activities; and these activities culminate in a final product that addresses the driving question.

Project-based learning is an instructional method centered on the learner. It does not use a strict lesson plan that directs a learner down a specific path of learning outcomes or objectives. Instead, project-based learning allows in-depth investigation of a topic worth learning more about. Through the construction of a personally meaningful final product, which may be a play, a multimedia presentation or a poem, learners present what they've learned. In addition, learners typically have more autonomy over what they learn, thus maintaining interest and motivating them to take more responsibility for their learning. Project-based learning and the construction of a final product encourage the diversity in learners, such as interests, abilities and learning styles. It imparts thinking competencies and creates a flexible learning environment, where learners can explore new areas, discover new scientific issues and integrate knowledge from different subjects.

Project-based learning can be described as involving both vertical learning (i.e., cumulating of subject matter knowledge) and horizontal learning (i.e., generic skills such as project management).

The main aim of project-based learning is to establish an active connection of pupils to the educational process. Problem situations and questions are created by teachers. These situations and questions cause students to think about the topic. Project scenarios are un-detailed and the final form is collaborative with students. The project realization is dependent on their creativity, fantasy, critical thinking, motivation, interests, and requirements. Teachers and pupils are inspired by their surroundings and by real life problems.

2.1 Methods of using project-based learning

Kleijer, Kuiper, De Wit and Wouters-Koster (1981) see four major characteristics of project-based learning - self-responsibility for thinking and learning, awareness of social responsibility, thinking and acting from the scientific perspective but in a practical application and relating both group process and product with professional practice.

Morgan (1983) provides three general models of project work for educational purposes:

(1) Project exercise: In this type of project the students apply knowledge and techniques that they have already studied and are familiar with. It is the most traditional type of project-based learning. Project exercises are part of a teacher-centered project

(2) Project component: This type of project work is characterized by a larger scope, real world issues and interdisciplinarity. It develops students' problem-solving abilities and provides more opportunities for independent work. Often, traditionally taught courses are studied in parallel with the project course.

(3) Project orientation: It involves the entire curriculum philosophy of a program of study; the projects that students complete form the entire basis of their university education, while traditional instructional teaching only supplements the requirements of the project topics. The subject material is determined by the demands of the project topics. Project components and project orientation are student-centered projects.

Project-based learning contains several features. One of them is the idea that a problem or question is used to drive learning activities. Another feature is constructing a concrete artifact or final product. This is where project-based learning is different from problem-based learning. In project-based learning the process of creating a final product forces the student or student team to think through the steps of the construction process, and to execute them in an orderly manner. As opposed to traditional studying, here gaps in knowledge cannot be overlooked or overcome by rote learning. Teacher's feedback may be given either through a formal midcourse assessment or as informal continuous tutorial discussions between the teacher and the project group. The third feature of student projects is learner control of the learning process, which gives the opportunity to make decisions regarding the pace, order and content of learning. Through learner control the students apply their prior knowledge and experience. Another characteristic of the project method is its potential for using and creating multiple forms of representation. In modern working life most tasks require the combined use of knowledge in different forms. One of the strengths of the project method is that it integrates not only knowledge from different subjects but also theory and practice – students can see and feel the practical realization and real life meaning of the topics they are studying and the work they are doing.

Heitmann (Heitmann G. 1996) differentiates between "project-oriented studies" and "project-organized curriculum". Project-oriented study involves the use of small projects within individual courses, progressing to a final year project course. The projects are usually combined with traditional teaching methods within the same course. They focus on the application and integration of previously acquired knowledge. Projects may be carried out individually or in small groups. In project-organized curricula the project is the basic structuring principle of the entire curriculum. Subject oriented courses are reduced to a minimum and related to a certain project. Students work in small groups with a project team of teachers who are advisers and consultants. Projects are undertaken throughout the length of the course and vary in duration from a few weeks up to a whole year (Kubiatko M., Vaculova I. 2012)

Nowadays, the use of information and communication technologies (ICT) is connected with project-based learning. ICT provides a rich learning environment and exposes the learner to a variety of representations and configurations. The presence of ICT may facilitate students' higher academic achievement and overcoming their cognitive difficulties.

2.1.1   Methods of using project-based learning

To create effective project-based learning tasks, teachers should use the following steps:

- Start with the end in mind.
- Devise the driving question; think of a central question.
- Plan the assessment and outcomes. Prepare clear assessment criteria.
- Decide how to structure the project.
- Find tools and strategies for successful projects in order to manage the project successfully.

This methods sometimes uses the following activities:

- Asking and clarifying questions

- Discussing ideas
- Making predictions
- Making plans and experiments
- Collecting and analyzing information
- Drawing conclusions
- Communicating and presenting ideas and findings
- Asking new questions

2.1.2 Components of a model case

All the models of project-based learning have distinctive features:

- "Setting the stage" an introductory segment to introduce the activity;
- a driving question and a task the students should complete;
- creating a final product through investigation or research;
- resources;
- scaffolding – teacher conferences to help learners assess their progress, computer-based questioning and project templates;
- collaborations – teams, peer reviews and external content specialists;
- opportunities for reflection and transfer – classroom debriefing sessions, journal entries and extension activities. (Trautn – Nare A., Buck G. 2011)

2.2 The seven steps of the PBL model

Implementation of the PBL model is to condition the learning process by following the syntax, thus creating interaction between teacher, students and instructional media according to the characteristics of the PBL Model. The syntax of the PBL model can be seen in Figure 1.
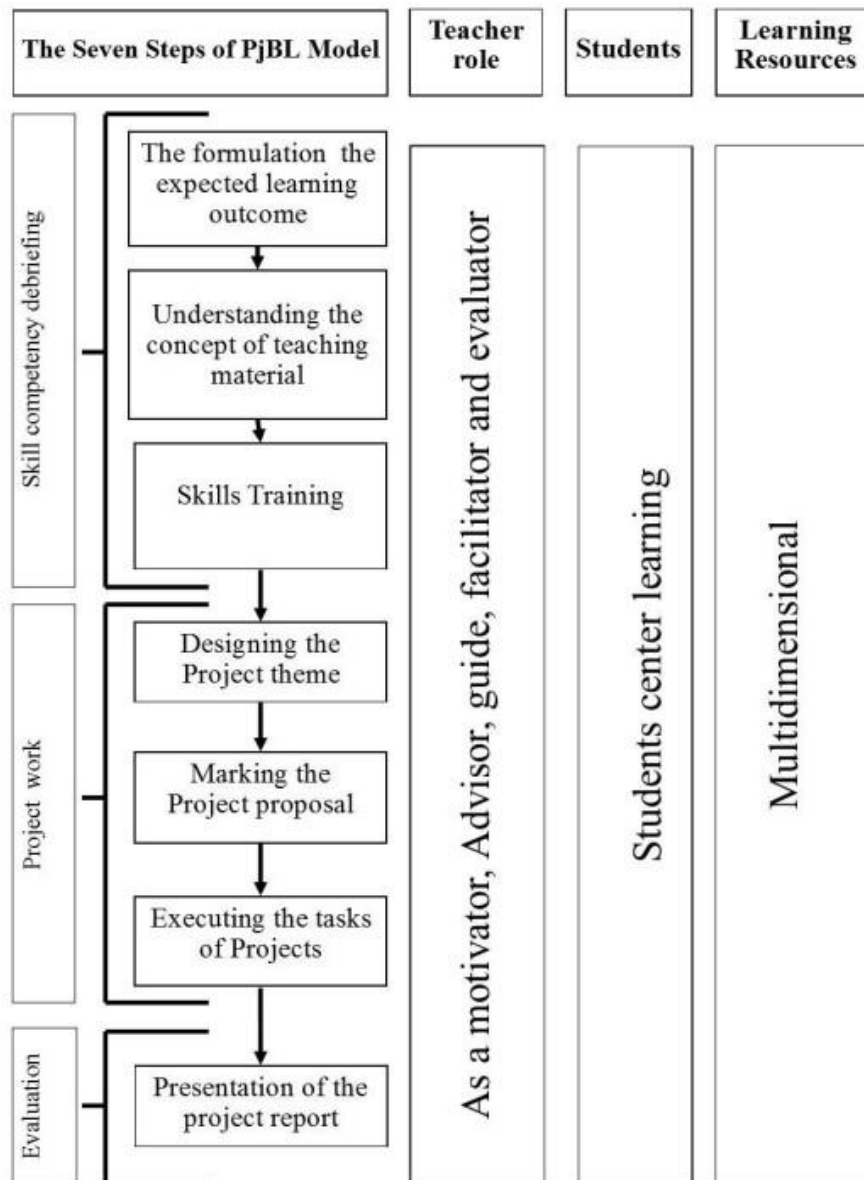
Figure 1. The Seven Steps of PjBl model

(Jalinus N., Nabawi R. A., Mardin A. (2017). The seven steps of project-based learning model to enhance productive competences of vocational students.)

The seven steps of the PBL model consist of three main stages (primary) then they are broken down into seven stages (secondary).

2.2.1 The primary stages

1) Skill competences debriefing, which aims to make students have an understanding about the expected outcome capabilities, motivate them to solve their project task, explain the basic concept of the teaching material, and the necessary skills needed;

2) Project work, the student assignment as a project work in PBL model lifted from real-world issues and processing of work stages realistic to a real workplace and relevant to learning outcome;

3) Evaluation, which aims to reveal the achievement of the learning process and students' competences, so that it becomes a matter for assessment and evaluation. More details of the seven steps of the project-based learning model about the role of faculty, student interaction and learning resources are listed below.

2.2.2 The secondary stages

1) The formulation of expected learning outcomes

This stage provides information and exploration by teacher and student's interaction about the learning outcomes obtained and review of the relevance of study materials into the real world. In this part it can be by using the contextual teaching and learning approach. Contextual teaching and learning is an understanding of teaching and learning that helps teachers real life situations to the content they are teaching. It motivates students to make connections between knowledge and its application in everyday life and engage in the hard work that learning requires. Project-based learning puts a motivating and meaningful real-world task in the center of the student's attention. Students need to be directed to discuss the problems emerging in their environment (real-world), so that they are better motivated to solve the problem.

2) Understanding the concept of teaching material

Understanding the concept of teaching material is to debrief knowledge to students. The role of the teacher is to instruct and guide students. Students must be involved actively in discussions about materials being studied. Cooperation is important at this stage. The cooperation-based learning-teaching environment of the study provided a cooperative learning environment, supported permanent learning, provided opportunities to be successful, contributed to the development of social and personal skills, but caused anxiety as it involved the expectation for students to be successful at all stages. Cooperative learning stimulated cognitive activities, higher levels of achievement and knowledge. In this study we developed a learning model as an instructional media.

3) Skills training

Vocational training technique or operation of the machine intended to make students master the essential content of the technical or operational machinery of the subjects taught and debriefing practice skills before students carry out project tasks. The learning method can be done through demonstration and practices.

4) Designing the project theme

The early stage of designing a theme is when the teacher and students   discuss   and identify real – world problems or challenges that arise in areas where the school or college is located. The primary reason for project-based learning (PBL) is the need to adapt to a changing world. The argument is that students should thrive in an environment centered on learning instead of on teaching. Identifying potential areas can be done through surveys, interviews with certain

societal groups and students about problems or challenges that developed in each area. Students identify real problems to pursue and they investigate them through real-world sources of information (e.g., interview, internet sites, magazine articles, primary sources). From some of the problems or challenges that arise in areas that have been identified, a teacher with students selects and defines what the real-world issues that will be served as the theme of the project tasks will be. Furthermore, students are divided into groups. In each group, students discuss what are products to be offered in order to solve a problem in the area (real-world) or to produce an innovative product that can be worthwhile economically and take decisions about the products that will be their project. After deciding on the products, the students submit a draft proposal to the teacher who then gives suggestions, feedback, consideration, and approval towards the proposal.

5) Making the project proposal

In this stage, the proposal of project tasks is created, it consists of:

- Problems and solutions
- Framework
- Estimated Production

   a. List of materials, consumables, and costs

   b. List of machines and machine costs/hour

   c. Estimated production activities and costs

In designing the project, the considerations are the availability of student consumables and machine facilities owned by the school. The following factors should be considered while selecting the material:

- Availability of the material
- Suitability of the materials for the working conditions in service
- The cost of the material.

6) Executing the tasks of the project

The execution of the tasks of the project are practical activities to students with good teamwork to show performance quality and to solve problems related to the project to realize the project design into a final product. The role of the teacher at this stage is to become a mentor, tutor, supervisor, and evaluator to allow students to carry out the learning process through inquiry process and constructing work on project tasks they are doing. In executing project tasks, students work in accordance with the estimated production activities, safety priority, solid teamwork, and consultation with teachers if any problems are found. 'Successful' in a job these days often implies being able to work in ill-defined and changing environments, dealing with non-routine and abstract work processes.

7) Presentation of the project report

A student presents the process of the work and results of the project tasks at a seminar in the classroom at the end of the lesson. This is followed by discussions between teachers and students about the deficiencies in the process and the results of projects that have been implemented. Teachers interpret students' mastery of the project tasks. The last seminar focused on the discussion between teacher and students. Students present their own perception, then evaluate each other. They discuss mistakes and suggest improving their own presentation. Teacher summarizes their own evaluation and peer evaluation.

2.2.3 Teacher role in project-based learning

In a project-based learning classroom teachers support students by providing guidance and feedback. The teacher must explain all tasks that are to be completed, give detailed instructions on how to develop the project, and answer questions and encourage student motivation. In order to create successful project-based learning units, teachers must plan well and be flexible. In this method, teachers are sometimes in the role of learner and peer with the students. Assessment in project-based learning can be carried out with a combination of tests, checklists, and rubrics; however, they often only measure task completion. The inclusion of a reflective writing component provides for self-evaluation of student learning (Goldney and Murphy, 2007).

Project based learning focuses on a real-world problem, learners must assume responsibility for their own learning, the teacher's role becomes that of a guide or facilitator, and the deliverable must relate the learner's life and/or career.

Assessment is carried out by the teacher during the learning activities. They evaluate each step of the process in order to measure the progress of student competence and as a reflection for the next step. Assessment as part of classroom activities is an essential process required to promote learning and achievement. Projects are an ideal vehicle for inviting students to demonstrate their understanding through a broad-based assessment approach. Assessment of the process of learning and learner-critical reflection are integral to project-based learning (Jalinus N., Nabawi R. A., Mardin A. 2017).

2.2.4 Students' role in project-based learning

Students work in small groups on a project-based learning model. They work in a team, distribute tasks, monitor progress, communicate, do research and are responsible for the implementation of tasks, work on problems, meet deadlines, develop critical thinking and presentation skills. In essence, they are "self-managers" - the active party in this approach to learning.

2.3 Challenges to practicing project-based learning

Implementing project-based learning in the classroom may prove to be challenging for experienced teachers and even more overwhelming for novices. Some of the difficulties in implementing project-based learning with helpful hints and practical advice for making project-based learning work in the classroom are as follows:

First, because project-based learning focuses on in-depth investigations while constructing personally meaningful final products, the tone of a classroom may change. This may cause discomfort for the students and the teacher. The roles that both parties are accustomed to may change perceivably as different students will be researching different topics. It's important to begin slowly. One experienced teacher with twenty-five years of experience suggests her "comfort zone would include two projects...rather than a continuous series of project-based science units". Another issue is class time. The in-depth research requires more time, so less time may be spent on other content in the curriculum. By beginning slowly, teachers can design projects that reflect local objectives and continue to state or national ones.

Next, almost all the examples of project-based learning put an emphasis on successful cooperative or collaborative learning. Students that lack teamwork skills may have difficulties negotiating compromise. In this case it may be necessary to teach learners how to work together

in groups and manage conflict within groups. Also, sometimes groups are used for other more practical reasons, such as insufficient copies of books or computers. Teachers need to make sure all learners have the opportunity to interact and develop skills with resources. However, if access to resources is not an issue, then teachers may want to be more creative with the incorporation of cooperative or collaborative learning, such as peer reviews and external expert interviews.

2.4 Practicing project-based learning assessment

In project-based learning students construct final products that represent their learning and it is important to provide feedback that is constructive and relevant to the objectives of the assignment. Assessing the quality of learning in this method can hardly be done by multiple-choice and true-false tests. A more appropriate option would be to include portfolios and rubrics. Portfolios provide the opportunity to use multiple forms of assessment through different types of works and allows the learner some choice over which items will be included. Additionally, portfolios demonstrate progress to learners, parents, and teachers for extended periods. Possible disadvantages of portfolios are that they take a lot of time to grade and can be subjective.

On the other hand, rubrics allow assessment to be more objective and reliable. When created before the start of the project, teachers can communicate their expectations for the project in the rubric, and the students are more aware of how their work will be evaluated. The rubric includes knowledge, reasoning, and communication - with levels of proficiency for each.

Daily or weekly reports are another good way to hold students accountable and gather formative information about their learning (Fig. 2). Using formative assessment in problem- and project - based learning. Students can report the outcomes of investigations and inquiries individually or as a group. In this way, the teacher is provided with valuable insight about students' progress and their learning needs. Thus the teachers can provide instructional guidance before students get too far off-track.

Student progress report.

Topic or question being investigated:
_____

Describe what you have learned about the topic above from the activities and research you have conducted.

List your sources of information.

How have your ideas changed as a result of your research? What were your ideas before? What are your ideas now?

What questions do you still have about the topic or question?

Figure 2. Example of students' progress report

(From: Trautn - Nare A., Buck G. (2011). Using formative assessment in problem- and project - based learning.)

For students to successfully complete a PBL unit, they must have a clear understanding of the learning objectives and performance standards. Providing a rubric with clearly stated evaluation criteria is an important step in helping students achieve their best. Near the end of the unit, teachers should provide time for students to reflect on their work using criteria outlined in the rubric (Fig. 3) .

Self-assessment and identifying aspects of their work they have to improve on and ones they have done well may prove helpful for students. They can also provide positive comments and feedback for their peers. Based on the self- or peer-assessment, students can then devise a plan to improve their work before final submission. Peer- and self-assessment does not have to occur at the end of a PBL unit but can be done several times while students are still learning.

Sample rubric.

Criteria	Advanced (16–20 pts.)	Proficient (11–15 pts.)	Basic (6–10 pts.)	Unsatisfactory (1–5 pts.)
Position	Position is clearly stated and consistently maintained. Clearly stated references relate to hypothesis.	Position is clearly stated and mostly maintained throughout letter. Some references made to hypothesis.	Position is not clearly stated or maintained throughout letter. Few references made to hypothesis.	Position is neither clearly stated nor maintained throughout letter. It is unclear which hypothesis was chosen.
Scientific concepts used to defend position	Uses science concepts to clearly and fully explain the position. Provides at least three reasons why chosen hypothesis is most plausible.	Uses science concepts to explain position, but not completely. Provides two to three reasons why chosen hypothesis is plausible.	Does not always use science concepts to fully explain position. Provides fewer than three reasons for why chosen hypothesis is plausible.	Completely lacking the use of science concepts to support position. Provides one or fewer reasons for why hypothesis is plausible.
Scientific concepts used to reject other hypotheses	Uses science concepts to clearly and fully explain one reason why the two rejected hypotheses are less plausible.	Uses science concepts to explain one reason why the two rejected hypotheses are less plausible. These reasons are not fully elaborated.	Does not always use science concepts to fully explain one reason why the two rejected hypotheses are less plausible.	Completely lacking science concepts to provide reasons why the two rejected hypotheses are less plausible.
Suggestions for further research	Includes and fully describes at least two suggestions for further research on chosen hypothesis.	Includes but does not fully describe at least two suggestions for further research.	Lacking suggestions for future research or suggestions are not explained.	Completely lacking suggestions for future research and no explanations are provided.
Writing conventions	Correct spelling, grammar, and punctuation are used throughout the letter. Essay is well organized and easy to read.	Minimal spelling, grammar, or punctuation errors. Essay is mostly organized and easy to read.	There are consistent errors in spelling, grammar, or punctuation. Essay contains minimal structure and organization.	Errors in spelling, grammar, or punctuation make reading difficult. Essay lacks structure and organization.

Figure 3. Sample of rubric with evaluation criteria

(From: Trautn - Nare A., Buck G. (2011). Using formative assessment in problem- and project - based learning.)

For formative assessment to be most effective, students are continually encouraged to share their thinking. It takes time and support for students to develop rich understandings of science content. Formative assessment is not about evaluating achievement; it is about eliciting what students do or do not understand about a topic. If students think they will be penalized, they will not disclose their confusion about a subject, which, in turn, makes formative assessment difficult.

Teachers should provide feedback to direct students toward the goals of the PBL unit. This should be positive and specific and focus on students' progress, not judge their capabilities. Feedback gets misguided students back on track, clarifies learning goals for confused students, focuses students who are drowning in information, and probes all students to think more deeply about the problem or driving question (Trautn - Nare A., Buck G. 2011).

3. EDUCATION FOR SUSTAINABLE DEVELOPMENT (ESD)

The importance of education for sustainable development (ESD) was already articulated in Agenda 21 and the blueprint of the 1992 UN Rio Conference on Environment and Development, which called for changed attitudes, values, and dispositions that are supported by skills and behaviors. Particularly, relevant to this study is the notion that a basic outcome of ESD should be the establishment of a pro-environmental stance or competency that involves intellectual and motivational aptitudes that advance one's propensity to act in an ecologically responsible manner. (Bramwell-Lalor et al., 2020)

Teachers play an especially important role in ESD, as they are the forefront implementers at the actual classroom level, and they are teaching knowledge, values, principles, and skills to their students. Thus, teachers serve as key change agents in transforming education and society towards sustainable development. ESD challenges the concept of the teacher as a disseminator of knowledge and requires the engagement of students in questioning social assumptions and dominant ways of thinking. Consequently, such a view has fundamental implications on how ESD engages with education systems and practices (Mathe M. 2014).

3.1 Practicing project-based learning for teaching ESD

Education for Sustainable Development focuses on content related to "wicked problems" which are complex in nature. A related consideration of the focus on ESD competencies is the question of how they can be acquired to enable successful solving of real-world issues (Lambrechts et al., 2013). The integration of competences for sustainable development in higher education: An analysis of bachelor programs in management. Journal of Cleaner Production identified three categories of teaching and learning methods suitable for ESD: they should be interactive and participative (e.g., group discussion and peer assessment), research oriented (e.g., problem analysis, values clarification) and action oriented (e.g., solving real community problems). Project-based learning has been named as an action-oriented strategy suitable for ESD.

The Buck Institute of Education (English & Kitsantas, 2013, p. 130) defined PBL as a "...*method that engages students in learning knowledge and skills through an extended inquiry process structured around complex, authentic (real-life) questions and carefully designed products and tasks*". PBL is a critical strategy "*for creating independent thinkers and learners. Children solve real-world problems by designing their own inquiries, organizing their research, and implementing a multitude of strategies.*" (Stefanie Bell, 1983). These definitions suggest students are central in PBL, actively self-regulating their learning, and connecting with them.

One model of PBL has identified the following necessary elements: a central question (open-ended, complex), student voice and choice (they select their own topic and resources for inquiry), opportunities to build 21st century skills (communication, collaboration, critical thinking, creativity and technology use) and findings publicly presented (e.g., to the community, parents, peers).

The benefits of PBL include increased understanding of particular issues, motivation, independent thinking, responsibility, collaboration, communication, and problem-solving skills.

The characteristics of PBL are aligned with ESD competencies. For instance, strategic competencies (developing and implementing actions), collaboration (facilitating participatory problem solving, learning from others, dealing with group conflicts), critical thinking (questioning norms, practices and opinions) and integrated problem-solving competencies (applying problem-solving frameworks to complex problems and developing solutions) can be facilitated through PBL.

Project-based learning and the concept of acquiring sustainability competencies are aligned with social constructivism in which learners construct knowledge through experiencing things, reflecting on those experiences and interacting with their peers for discussing, generating, and sharing information. Both are also aligned with the experiential learning theory where individuals' learning is linked to applying various skills to real-world problems (Bramwell-Lalor S. et al 2020).

3.2 Example of project-based learning for teaching ESD

Project-based learning with younger learners - TrashedWorld https://www.trashedworld.com/en

Context: TrashedWorld is a web-based platform hosted in Bulgaria. It is based on a documentary film Trash that investigates the global impact of modern consumerism on pollution. The platform was created with the role of education in engaging young students on environmental and sustainability issues in mind. Developing awareness of waste issues and improving communication among users are two major aims of the platform. Content and language integrated learning is the disciplinary specialization of one of the designers (also an author of this paper) thus a core focus skill is improving communication while dealing with environmental issues.

Each of the four modules in the programme focuses on a waste issue presented in the Trash documentary. The lessons on the platform include a glossary, vocabulary, comprehension activities and a project-based activity where students explore a waste issue in their school or community.

Outcomes: The platform was launched in June 2016. After registering their school, teachers accessed the resources on the platform. After working with the content and activities in the modules, the students devised their investigation and implemented it in their schools or communities. They recorded their results and experiences in different forms (videos, PowerPoint presentations, report sheets). These final products were uploaded on the website by their teachers and can be accessed globally. Feedback about the platform was given by teachers via the website or social media. The investigation reports and final products revealed that students collected data through forms such as questionnaires and interviews administered to community members. The reports and final products of the students from Slovenia, Bulgaria and Italy were analyzed to provide insight into students' activities.

In Slovenia, students produced a PowerPoint presentation entitled the 'Circle of Trash', investigating waste management in their communities. They identified different types of community waste and considered how they were discarded. Their conclusion is that waste management policies in their community were effective.

Bulgarian students created news posters on a 'waste clean-up campaign' in their community which were displayed at their school. The students were very closely involved in the project . One student said: "*The trash is there because of the US! It is our responsibility to clean it. We must try to preserve our town for future generations.*"

Italian students completed various projects in their school, home and community. One of the projects was about waste separation at home and tracked how much waste was generated. They

reported: "We produced about 10 kilos of glass during a week, about 2 kilos of paper and 15 kilos of plastic". In another project, the students compared grocery store packaging in their city with examples in the film and reported that the dimensions were similar.

The students applied critical thinking to the knowledge gained through their investigation. One group wrote "*... half of the inhabitants use bins so the town is very dirty ... in the city centre on the floor there is scrap paper, chewing gum or cigarette butts*". Students started to form opinions about the habits of fellow residents. According to one report, "*... sometimes we find some plastic wraps or some cans on the ground because some people don't care very much about the environment ...*". Another report stated: "*We think many people don't use bins because they don't care a lot about the environment. Others, instead, know how much this can help the planet, so they use them ... Also, a lot of people don't recycle because they simply don't know the consequences*". Through the platform these learners communicated with their peers locally and in other countries about the environmental issues. Comparisons made with environmental issues globally support competency in self-awareness. (Bramwell-Lalor S., Ferguson T., Hordatt Gentles C., Roofe C. 2020)

4. CONCLUSIONS

Project-based learning has relevancy in facilitating ESD competencies. It centralizes teachers' and students' learning experiences to boost different skills and competencies associated with environmental and sustainability actions in numerous cultural contexts. They include collaboration, critical thinking, strategic competencies, self-awareness, and communication. All these competencies are important in addressing the local and international challenges facing the twenty-first century world. Project-based learning takes varied formats and can be applied in formal and non-formal settings.

Project-based learning is a cooperative learning model that accommodates the ability of children to practice the process of free and creative thinking. Implementation of PBL is the participation of learners in understanding the reality of life from the concrete to the abstract one. The reality of life is a source of inspiration and creativity in analyzing and developing a vision of life. Learning requires strategies that can synergize academic skills such as understanding the theory and soft skills (problem solving, teamwork, self-reliance, self-confidence, responsibility, honesty, and communication skills to convey ideas and concepts through presenting the group project). One of the strategies offering such synergy is project-based learning. It stresses on education that facilitates the practice of student-centered learning systems by collaboratively integrating real and practical problems and effective teaching in building knowledge and creativity (Indrawan, Jalinus, Syahril, 2020).
The circular economy is clearly linked to the field of sustainability by promoting economic, social, and environmental development while ensuring the progress of future generations. On the other hand, it is clearly related with the promotion of the SDGs [11, 12, and 13].
The application of circular economy techniques for the design and development of products is appropriate for implementing and improving the analytical capacity of different circular economy strategies. In this way, knowledge relating to energy efficiency, reuse, or eco-design that enriches the solution obtained is acquired by students. In addition, the results show the advantages of implementing the teaching of the circular economy throughout VET, completing the students' training in sustainability.

Throughout Europe numerous projects were implemented with the aims of improvement of CE concept knowledge. Examples of project-based learning models that cover the topic of SD could

be as follows: a web-based platform hosted in Bulgaria, was constructed based on a documentary film Trash that investigates the global impact of modern consumerism on pollution; in Slovenia, some students investigated waste management in their communities and produced a PowerPoint presentation entitled the 'Circle of Trash'; in Italy, after watching the documentary clips, students implemented various projects in their school, home and community.

In conclusion, PBL transcends disciplines and cultures. It is a valuable teaching-learning method that supports environmental learning, fosters ESD competencies and can bridge the gap between environmental and sustainability knowledge and action.

Keywords: Project based learning, Education for Sustainable Development

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7

MICRO-LEARNING METHODOLOGY FOR TEACHING EDUCATION FOR SUSTAINABLE DEVELOPMENT

CHAPTER 7

MICRO-LEARNING METHODOLOGY FOR TEACHING EDUCATION FOR SUSTAINABLE DEVELOPMENT

Author:

Živilė Navikienė, S.A.F.E.Projects (The Netherlands)

Collaborator:

Žilvinas Kapočius, Kėdainiai Vocational Educational Training Centre (Lithuania)

1. INTRODUCTION

Today when we are facing different challenges (pandemics, conflicts, Earth's climate warming) we have more than ever to think about how to construct a curriculum of VET which could be focused on broad use for all people and communities. VET should take the role of leaders and inspire sustainable solutions for professions and sectors which could make huge changes making the process more sustainable. Micro-learning methodology for teaching ESD encourages learners and curriculum developers to create content that is relevant based on knowledge, competencies, and experiences which includes SDG.

2. MICRO-LEARNING CONCEPT BASED ON MODULAR TRAINING

Micro-learning focuses on a short learning material concentration which could be used in formal and non-formal learning. Micro-learning could be understood as a module unit or part of a module unit. Experience collected through different micro-learning courses could finally be recognized as a module that could be one part of the qualification.

Micro-learning concept is based on module perception which Navikienė (2010) defines (see Table 1) as module feature levels that allow understanding the module perception. There are three module feature levels distinguished: qualification, program, and competence. The qualification level of the module features indicates the interface to the qualification framework and defines a module as an integrated part of the qualification structure. In the level of qualification, a multiple module occupational suitability is reflected. The module is perceived as a structural unit of a certain vocational qualification acquisition program, which has its own purpose, content, didactic and methodological techniques, and evaluation. The most common modules are formed for the acquisition of specific qualifications. A module is the smaller component of the independent education/ learning, which may be offered to each student in different forms and sizes, oriented to the subject or theme.

Micro-learning can consist of the whole module or part of the module or module unit as a small, independent, short learning component, chapter, part, or unit of study. An educational module is a necessary and sufficient training (learning) material, integrating different training (learning) methods.

Table 1. The characteristics of the module feature levels (Navikienė Z., 2010).

Feature level	Module features	Definition of a module
Qualification	*Integrated part of qualification*	A module is an integrated part of a broadened qualification or a group of skills in the form of vocational training.
	Multiple occupational suitability	The modular system is effective in vocational training if the modules are suitable for a number of vocational fields.
Program level	*Structural unit of a program*	The structural unit of a certain vocational qualification acquisition program has its own purpose, content, didactic and methodological techniques, and evaluation. The most common modules are formed for the acquisition of specific qualifications. The modules integrate the knowledge of different sphere subjects.
	Independent, the smallest, short learning component, chapter, part, unit	A module is the smallest component of the independent education/ learning, which may be offered to each student in different forms and sizes, i.e. oriented to the subject or theme. Modules mean a short educational/ training chapter or unit, study section, part, a unit of study.
	Targeted functioning component	An educational module is a necessary and sufficient training (learning) material, including different training (learning) methods. The module is a targeted functioning component, which unites the training (learning) curriculum; it is a measure of the modular curriculum. The module itself may contain any form of the information source.
Competence level	*Formally structured learning experience*	A self-contained, formally structured learning experience. It should have a coherent and explicit set of learning outcomes, expressed in terms of competencies to be obtained, and appropriate assessment criteria. [ECTS]
	An information section focuses on the desire to acquire competence(s)	The module is a well-organized, concentrated course of mini instructions, directed by its target to the development/ training of competencies. The module manifests itself by logically completed units (learning material), and also activates the targeted operation program and systematic leadership to achieve the didactic objectives.

Micro-learning can be focused on qualification, program, or competence level. Most learners find it interesting to follow competence level modules, and units because the competencies could be quickly developed, and they look more attractive to choose from compared with a whole

qualification program. The program level module, unite shows competencies that are connected with vocational qualification acquisition. Micro-learning content can be based on program-specific competencies important for qualification. However, non-formal learning providers emphasize the importance of independent, short learning components, chapters, part, unit which do not lead to a qualification. These modules are based on a micro-learning methodology targeting functioning components and responses to the market needs.

Based on Navikienė's (2010), the perception of module definitions and features we could find similarities and connections between micro-learning and modular learning. Module features define the module as a complex multifunctional training (learning) element or the unit formed from the following components: educational target, creation of learning material, workshops, and control of knowledge acquisition. The module is a functional targeted combination, which combines the curriculum of training and its application technology. The micro-learning methodology is based on the modular training method since it consists of a targeted action plan, learning material, and methodological recommendations for didactic purposes. Micro-learning can consist of modules, and module units. Modules are closed and autonomous training (learning) units with defined duration, rules of operation, and evaluation. The modules can be taught (learned) in different order and forms. Each cognitive module has the influence and process of a different sphere. The cognitive module has specific access to the information area. Individual modules can be modified and adapted without changing the whole qualification.

Formal and non-formal learning focused on micro-learning attractiveness and accessibility can help to get new competencies easier and in a more flexible way – for example using open free resources. Micro-learning process for formal education could be understood as a module unit. In a non-formal learning system, it could be used as a self-learning element.

Micro-learning methodology focused on recognition and gained competencies development and accumulation of competencies could lead to following the whole module and later a whole VET program. For VET schools, attractiveness and realization of the systematic knowledge and understanding principle (prior knowledge assessment and confirmation), and individual learning process access should be carefully evaluated and recognized in micro-learning. The module is seen as a composite element, a multifunctional unit that could be understood as a micro-learning. The module is a component part of the training program, defined as a clearly structure-sized unit. The curriculum based on modules allows flexibility to acquire the desired qualification, or part of it, because it is clearly composed architecturally, functionally, and logically. Navikienė (2010) emphasizes that the module is comfortable, and accessible to the entire structural learning unit, with the help of which the qualification is divided into clear learning components. The module is defined as an independent, small, short learning component, chapter, part that everyone can learn in a flexible learning way. That's why micro-learning methodology should be based on modular training principles and ideas.

Micro-learning content and structural features (see below fig.1) define basic elements of the micro-learning process and structure. Micro-learning structural features focused on accessibility, flexibility, functionality, clarity, and concentration of learning material. Accessibility could be ensured through different social channels, freely reachable to everybody. Functional feature of micro-learning importance shows that it should be presented in a useful way for the learner, to present a concentrate of material, which is clear and could be followed, watching a comfortable time for the learner.
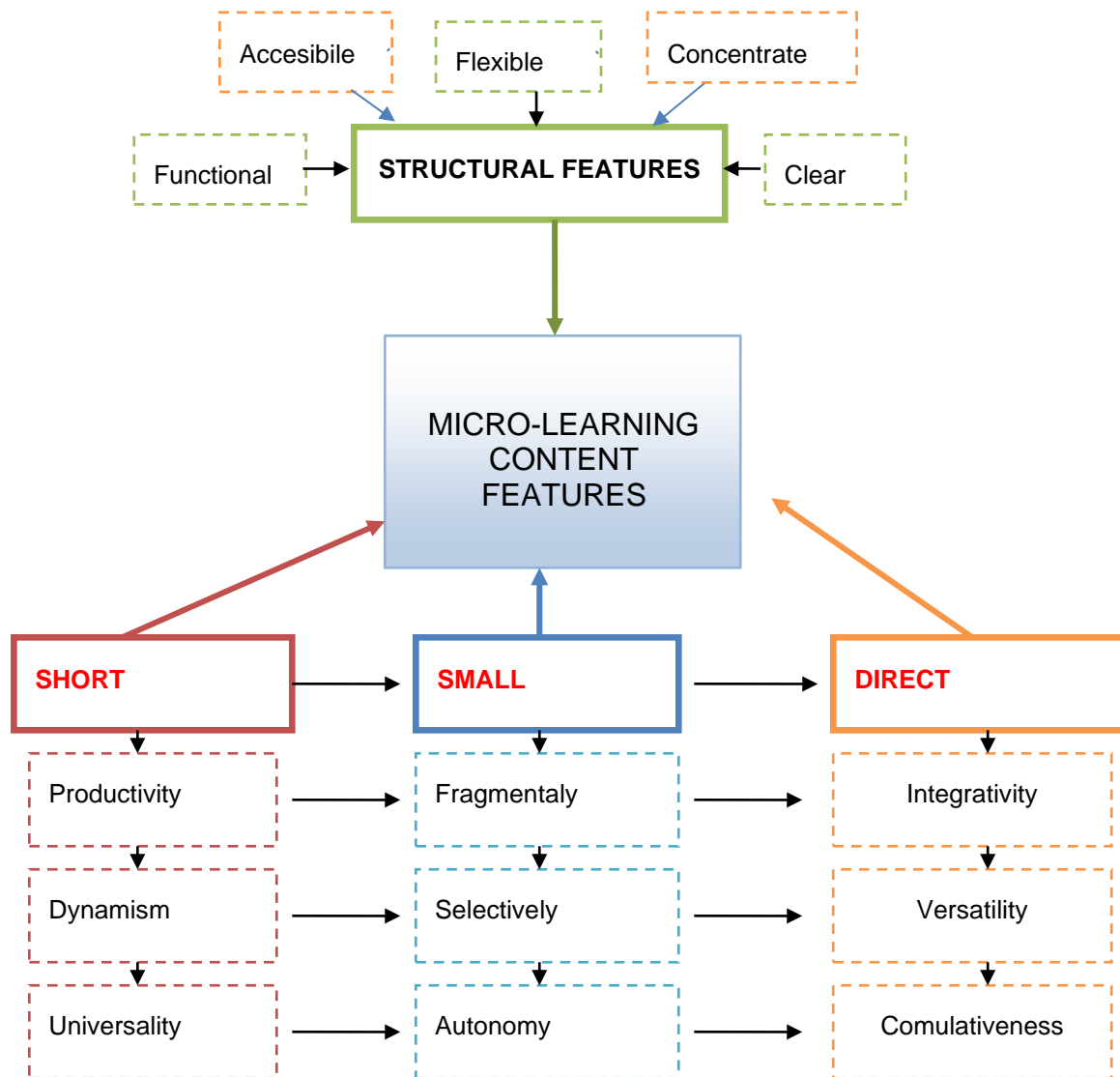
Figure 1. Micro-learning content and structural features (based on features of the module, Navikienė *et al.* 2011)

The micro-learning content features are short, small, direct. Short content of micro-learning should respond to these main features – productivity (to gain competencies), dynamism (attractiveness of learning material), and universality (micro-learning can be used for all types of learning and for everybody).

Micro-learning is a dynamic, specific, complex educational component and depends on personal/individual learning goals/modifications. A module is a structural unit of the program-oriented to acquire specific competence(s) of appropriate qualification level. However, micro-learning is separate from qualification but could strengthen specific professional competencies. The module is usually defined at the level of the program, since the purpose and the place of the

module are the components of the program, i.e. a structural unit designed to acquire sought competencies.

The process of micro-learning is connected with small portions of learning ideas, material, and content which are provided fragmentally, selectively, and autonomously. Micro-learning direct features consist of integrative, versatility, and cumulativeness.

2.1 Micro-learning principles

Micro-learning main principles are accessibility, flexibility, and functionality (utilitarian principle) and motivational, and teaching/ learning technology principles. Micro-learning functional (utilitarian) principle shows practical, functional, useful, and effective learning forms, methods, and ways. Micro-learning especially demonstrated motivationally, and teaching/ learning technology principles as one of the ways to engage learners with a small, short, and direct portion of specific knowledge, and skills micro-learning. Teaching/learning technology principles focus on how to use innovative platforms, and channels to engage and motivate learners to choose micro-learning.

Formal and non-formal learning consists of micro-learning elements and principles. Micro-learning could be officially defined as a part of modular training. According to the author (Navikienė, 2010) the main principle of modular training emphasizes the precondition of flexibility. One of the main principles of micro-learning is flexibility too. Flexibility to choose learning material, time, and implementation (learning environment, channel) is one of the important micro-learning attractiveness features.

Analyzing the theoretical aspects of modular training in VET, Navikienė (2008) emphasized the necessity of integrating theory and practice into the teaching process. According to the author, only the balance of theoretical and practical teaching can ensure the adequacy between teaching/ learning and work systems. The above described four micro-learning principles allow us to perceive the levels of this teaching system and define how micro-learning should be constructed.

Micro-learning duration depends on a lot of factors (goals, approach, etc.), however, it should be short, small and focused to the point of learning.

2.2 Micro-learning methods

Micro-learning approach to the content depends on the goal, methods, chosen tools, and channels (table 2). An important element of non-formal micro-learning is that it could be recognized in a formal education system. The goal of micro-learning methods is focused on the needs/interest of the target person/group. Learning approach and content depend on the main skills that the learner wants to develop. Micro-learning methods are focused on interaction using digital tools and channels, different digital platforms, and apps which makes micro-learning attractive. Micro-learning methods, tools, and channels depend on goal and learning content.

One of the possible goals could be the integration of occupational aspects with ESD, methods could be chosen differently (visualization, interactive tools, connection profession competencies with ESD). How to develop content depends on the curriculum developer but quizzes, questions, responses sections, infographics, and informational material can be used.

Table 2. Micro-learning methods (Navikienė Z., 2022).

Goal	Methods	Tools	Channels
- create content connected with needs/interest of target group - support curiosity and expanded - empower with popular facilitating online learning	Learning approach How to develop main skills Involvement of learners Self-test Interaction using digital tools	Explainer videos Brief & interactive videos Micro-lectures Whiteboard animations Kinetic text-based animations Presentations	Digital platforms, MOOC
-Integration of occupational aspects with ESD	Visualization Interactive tools Connection profession competencies with ESD	● Multiple question quizzes ● Polls, flashcards ● Question & responses ● Simulations ● Learner recordings to answer questions ● Statistical infographics ● Informational infographics	Micro-learning apps: Google Youtube Headspace Lasting Word of the day TED Games Digital badges
- engage and stimulate interest in occupational innovations	Create a supportive learning environment	● Timeline infographics ● Process infographics ● Geographic infographics ● Comparison infographics	Micro-learning social platforms Tiktok, youtube, Facebook, Instagram, Twitter, TED talks, LinkedIn

		● Hierarchical infographics ● List infographics	
-reach the target group with the right tools and channels	Interact and engage through innovative methods	*personalized learning*	Use channels which are the most popular

The attractiveness of micro-learning emphasizes the importance of visualization (videos, infographics, presentations). The most attractive and popular learners' platforms and channels are used to create a micro-learning methodology. Micro-learning successfully could fulfill not only the integration of occupational aspects with ESD and connect green skills with occupational necessity but also develop transversal competencies.

Micro-learning could have different forms and there are a lot of different possibilities to follow courses, module units, or short inspirational talks which could help to fill the gap between existing and future competencies. Micro-learning construction should provide a learner the possibility to recognize learning experiences later. There can be different ways that could be helpful for the future learner to continue further to be involved in a broader learning process. Micro-learning developers should think about how to make micro-learning attractive for the learner, to suggest collecting badges for an online course and recognizing part (module) of the qualification based on hours or filled assignments.

5. MICRO-LEARNING TEACHING: ESD EXAMPLES

Non-formal learning continues every day and everywhere but systemic non-formal learning focused on sustainable competencies develops just by starting the first steps. Online courses, short lessons, video material, talks, and explanations can be found on the internet. VET schools, business companies, and NGOs should work together with all possible stakeholders (community) to reach common goals that are based on SDG. How to empower VET students, teachers, employers, employees, and community members to work based on sustainability, and to think before using, and producing. Empowerment with green skills can be done using micro-learning. Micro-learning is the easiest way for business companies, schools, NGOs in a faster and more sustainable way to be involved in competencies development. Micro-learning forms could bring us directly to the explanation video and infographic, which helps us manage time and concentrate only on missing information.

Integration of sustainability to different contexts became a need of each organization, that's why choosing a micro-learning form, methods, and tools that help to reach learning goals much faster and focused on the demanded topic.

Non-formal education providers offer a huge number of learning courses to business organizations and have already started to give attention to how to integrate sustainable

development goals into business strategy and working process. Wals *et al.* (2017) asserts that "*Non-formal and community learning for sustainable development presents and analyzes a wide range of non-formal ESD practices from different parts of the world*". Micro-learning courses (table 3) focused on ESD can be found on the Internet and followed for free. Education for sustainable development focused on how to solve practical issues.

Table 3. Micro-learning courses focused on ESD (Navikienė Z., 2022)

Micro-learning courses focused on ESD	
1.	For everybody who are interested in circular economy https://circular-skills.org/online-course/ Checked and active (2022 june)
2.	https://circulab.academy/courses/activate-circular-economy/ Checked and active (2022 june)
3.	https://mooc.saxion.nl/courses/course-v1:SAXION+OfS1+2122q1/about?utm_source=MOOC+Organizing+for+Sustainability Checked and active (2022 june)

Vocational education and training schools are actively working on sustainable topics integration into the curriculum. VET schools constructed sustainable implementation strategies which help not only to develop students' skills, but also empower teachers to integrate sustainability in daily school life. Prepared *Guidelines and recommendations for reorienting teacher education to address sustainability* (Koïchiro Matsuura, 2005) defined the main aspects of creating educational materials in various disciplines. These guidelines can be used as starting points for developing guidelines for ESD projects.

Micro-learning is based on social stakeholders (teacher, non-formal educators, and professionals working in organizations) connections, ESD networks that complement each other in their expertise and approaches. Social, environmental, and business issues could be connected through SDG and ESD.

6. CONCLUSIONS

Micro-learning is an approach attractive for all types of learning as well as for introducing new learning topics for sustainable development and green skills.

The micro-learning methodology delivers content to learners, in short, focused, and easily digestible learning segments. This is accomplished through short lessons that give students the needed information. The micro-learning activities facilitate active participation by learners by promoting the exploration, the use, and the creation of content. Microcontent provides a viable solution to fast-paced and multi-task-oriented patterns of learning and working today, enabling learning in small steps and with small units of content through social interaction.

According to various research, micro-learning is an excellent approach to online learning. We can use it not only in the classroom but also to create online resources and training courses. Micro-learning aligned with formal learning and embedded in online communities has the potential to support ongoing professional development.

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8 CONCLUSIONS

CHAPTER 8

CONCLUSION

This methodological material has been produced in relation to the themes of education for sustainable development, circular economy, green skills, project-based learning and micro learning. The extensive research was conducted by all partners in the Consortium with the aim of establishing the needs of the future education and job market and how the aforementioned could be met in the realm of VET schools.

In itself, education for sustainable development (ESD) is the response of the education system to the urgent and dramatic challenges our planet has been facing for years now. The development of the concept has undergone a number of developments, with UNESCO's definition being most broadly used today. According to the organization, ESD "means including key sustainable development issues into teaching and learning, for example, climate change, disaster risk reduction, biodiversity, poverty reduction, and sustainable consumption. It also requires participatory teaching and learning methods that motivate and empower learners to change their behavior and act for sustainable development. Education for Sustainable Development consequently promotes competencies like critical thinking, imagining future scenarios and making decisions in a collaborative way."(UNESCO, 2014) It covers the three pillars of sustainability, namely environmental, social, and economic. Complex sustainability challenges have a far-reaching effect in numerous spheres, hence ESD has to address most, if not all of them. This has called for a number of national strategies and a turn of the focus in the partner countries. For instance, the Netherlands has established a National plan for ESD under the title 'DuurzaamDoor' in which formal, non-formal and informal learning is supported. Lithuania has ratified the Government's commitment to incorporate the global principles of ESD into national educational programmes through different strategies. In Bulgaria, there is a Strategic Framework for the Development of Education, Training and Learning until 2030, and as far as Estonia is concerned-there is a national strategy "Sustainable Estonia 21".

International interest in sustainable and inclusive growth has gained impetus because of the recognition that the "brown" economy model does not address global issues such as growing inequality and social marginalization, environmental degradation, and resource depletion. Evidence has shown that the "green" economy is a potential source of employment, can halt further productivity loss, and can address climate change and environmental degradation. Circular economy is becoming one of the driving forces for future development. All of this is evidently leading to the need of green skills that can meet the needs of the future. The results of the questionnaires and interviews with VET teachers and company representatives support that thesis and establish both the interest and need for the integration of ESD and the related themes, so as to prepare the future workforce. In Europe, this has been further strengthened by the European Green Deal (EGD), which foresees changes in the numerous economic sectors.

When we consider Project-based learning (PBL), it was established that it is relevant in facilitating ESD competencies. It centralizes teachers' and students' learning experiences to enhance various skills and competencies related to environmental and sustainability actions in different cultural contexts. In this project, PBL will go hand in hand with micro-learning, which is an approach attractive for all types of learning as well as for introducing new learning topics for sustainable development and green skills. Its methodology delivers content to learners, in short, focused, and easily digestible learning segments. This is accomplished through short lessons that give students the needed information. During the research, it was established that these two approaches can provide the necessary knowledge, skills and experience to students in VET schools that will move on to join the job market and work towards sustainable development.